INDUSTRIAL MEDICINE AND SURGERY

Volume 24 OCTOBER 1955 Number 10

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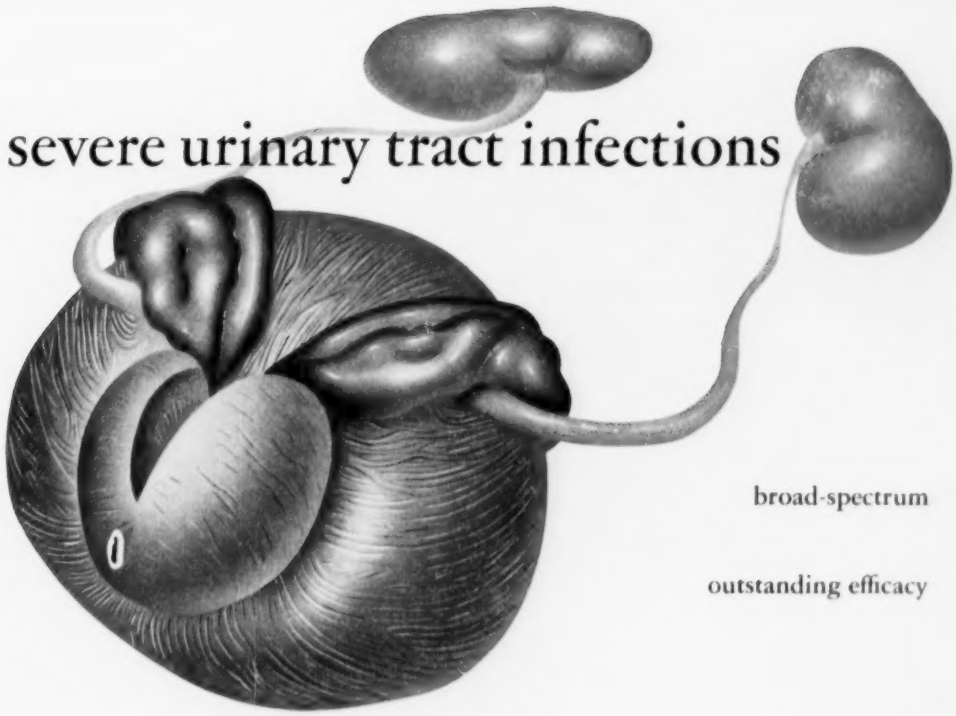

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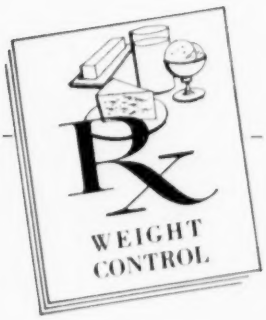

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JEAN SPENCER FELTON, M.D., Associate Professor of Medicine, and Preventive Medicine and Public Health, University of Oklahoma School of Medicine, has been appointed a member of the President's Committee on the Employment of the Physically Handicapped.

ALBERT G. LEWIS, JR., M.D., who has been Medical Director of the Industrial Health Council of Birmingham, Alabama, has joined the staff of the Southwest Florida Tuberculosis Hospital at Tampa, Florida.

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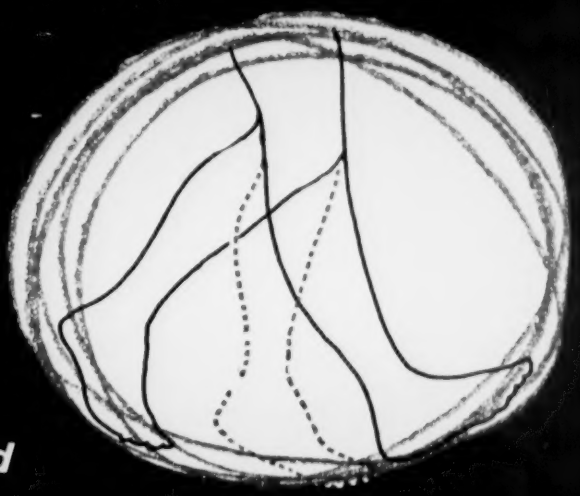

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COLONEL B. DIXON HOLLAND, of Austin, Texas, has been appointed Chief of Industrial and Preventive Medicine at Aberdeen Proving Ground. COLONEL HOLLAND took his pre-medical training at the University of Texas; attended the University of Texas School of Medicine in Galveston, for his B.S. and M.D. degrees. He entered active service in the Medical Corps, Regular Army, in January, 1937. Before coming to APG, he had served in the Surgeon General's Office since 1953. From 1949 until his assignment to Washington, he was in Germany as Post Surgeon, Wurzburg Military Post, and Commanding Officer of the 57th Field Hospital, and later as Post Surgeon of the Southern Area Command, and Commanding Officer of the 4th Mobile Army Surgical Hospital. Previous assignments include Assistant Commanding Officer at the Army Industrial Hygiene Laboratory at Army Chemical Center, and a tour to Fort Churchill, Canada, as a representative of the Surgeon General to observe health and sanitation conditions in cold weather operations. He was Director of Training, Army Service Forces Training Center, Camp Barkeley, Texas, and Camp Crowder, Missouri, in 1944 and 1945, and in the Office of the Surgeon General in Washington until 1946. During World War II, COLONEL HOLLAND served overseas as Surgeon to a task force in Jamaica, BWI; in Puerto Rico; as Commanding Officer of a Medical Battalion and Station Hospital; and as Assistant Surgeon of the Antilles Department.

MELVIN R. PLANCEY, M.D., of Los Angeles, has been appointed Assistant Medical Director of Richfield Oil Corporation. DR.

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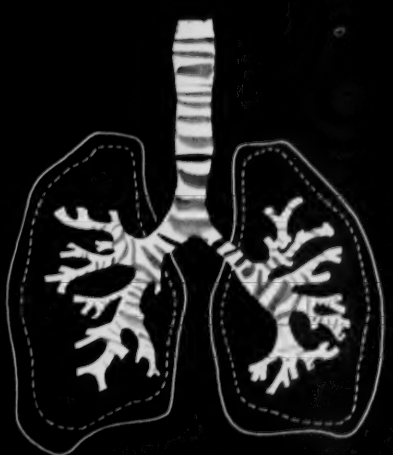

1. Forsham, P. H., et al.: Paper presented at First Internat. Conf. on Prednisone and Prednisolone, New York, N. Y., May 31-June 1, 1955.

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PLANCEY was formerly Director of the Division of Industrial Hygiene, Los Angeles County Health Department. He received his M.D. at New York University College of Medicine in 1940; his M.P.H. at Yale University College of Medicine in 1948. He has been Lecturer in Industrial Health, University of California at Los Angeles and University of Southern California, since 1949.

ROBERT W. HOWES, JR., M.D., has been appointed Plant Physician at the O. Ames Company, Parkersburg, West Virginia. DR. HOWES is a graduate of Parkersburg High School, West Virginia Wesleyan College, West Virginia University, and the Medical College of Virginia. He took his internship at Mount Carmel Hospital in Columbus.

MAYNARD A. PIKE, M.D., recently moved from Hamilton, Ohio, to Decatur, Illinois, to become Plant Physician for Caterpillar Tractor Company in that city. He was formerly doing full-time industrial medical work for General Electric Company, at Evendale, Ohio. Following graduation from Hahnemann Medical College in 1947, DR. PIKE engaged in private practice which included considerable industrial work for about five years before entering the field full-time with General Electric in 1953.

ELMER F. HERRING, M.D., of San Fernando, has been appointed Director of the Tuberculosis Control Division of the Los Angeles City Health Department. DR. HERRING was formerly the Tuberculosis Control Officer for the Veterans Administration Hospital, San Fernando Valley, in charge of detection and follow-up of tuber-

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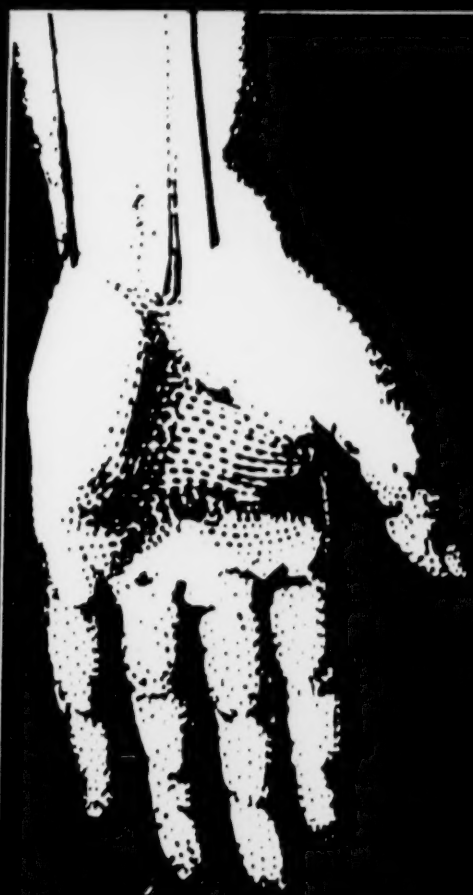

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1. Forsham, P. H., et al.: Paper presented at First Internat. Conf: on Prednisone and Prednisolone, New York, N. Y., May 31-June 1, 1955.

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culosis cases among employees. After graduation at Hahnemann Medical College, Philadelphia, in 1931, DR. HERRING devoted the first 10 years of his medical career to private practice in Wyncote, Pennsylvania. His military service included three months at Fitzsimons General Hospital (U. S. Army), Denver, in the treatment of chest disease patients, 1943; AAF Hospital, Topeka, Kansas, in x-ray, tuberculosis and venereal disease services, 1944; and general medical officer in charge of venereal disease and tuberculosis control in various AAF Bases, 1944-45. From 1945-48 he was in charge of tuberculosis and silicosis control among 6,000 pottery workers in East Liverpool, Columbiana County, Ohio. DR. HERRING came to California in 1948 and joined the staff of the Veterans Hospital that year, where he remained until November, 1954.

ALBERT S. J. CLARKE, M.D., formerly identified with the Cooper Clinic, Fort Smith, Arkansas, and later Lieut-Colonel, Hq. 4107th ASU, USAH, Red River Arsenal, Texarkana, Texas, joined the Medical Department of Phillips Petroleum Company August 8, 1955. He will be Physician in Charge of Phillips Petroleum's Medical Program in the Kansas City area.

RETIREMENT of ASSISTANT SURGEON GENERAL WILLIAM H. SEBRELL, JR., who has been Director of the National Institutes of Health, has been announced by DR. LEONARD A. SCHEELE, Surgeon General of the Public Health Service. His retirement follows 30 years of service. DR. SEBRELL will be succeeded by DR. JAMES A. SHANNON, presently Associate Director of the Institutes.

INSTITUTE of Industrial Medicine, New York Post-Graduate Medical School, with the College of Engineering is offering a course in Air Pollution, November 28-December 9, 1955. For information address Office of the Dean, Post-Graduate Medical School, 550 First Avenue, New York 16.

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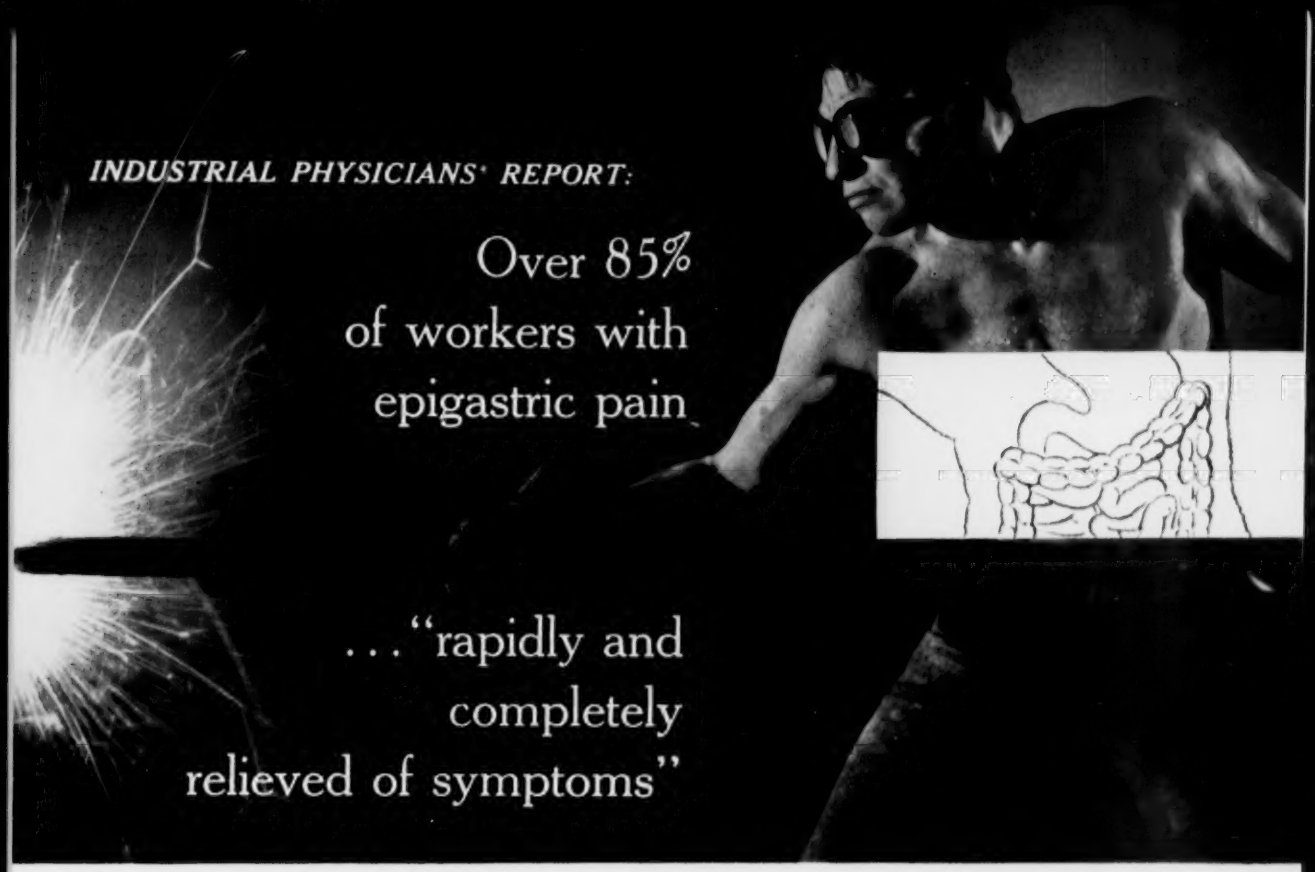

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Donnatal Extentabs contain active ingredients equivalent to three regular Donnatal tablets—bottles of 100 and 500.

*Frank W. Barden, M.D., Paul S. Hill, M.D., William F. Mahoney, M.D., and Kenneth J. Cuneo, M.D., in a report from the Medical Department of the Saco-Lowell Shops and the Webber Memorial Hospital, Biddeford, Maine; published in the January, 1954 issue of the Journal of the Maine Medical Association (Vol. XXXXV, No. 1, Page 11).

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ples Gas Light & Coke Company, Chicago, are among the leaders in industrial medicine on the program of the Occupational Health Nursing Section of the National Safety Council at the 43rd National Safety Congress in Chicago, October 17-21, 1955.

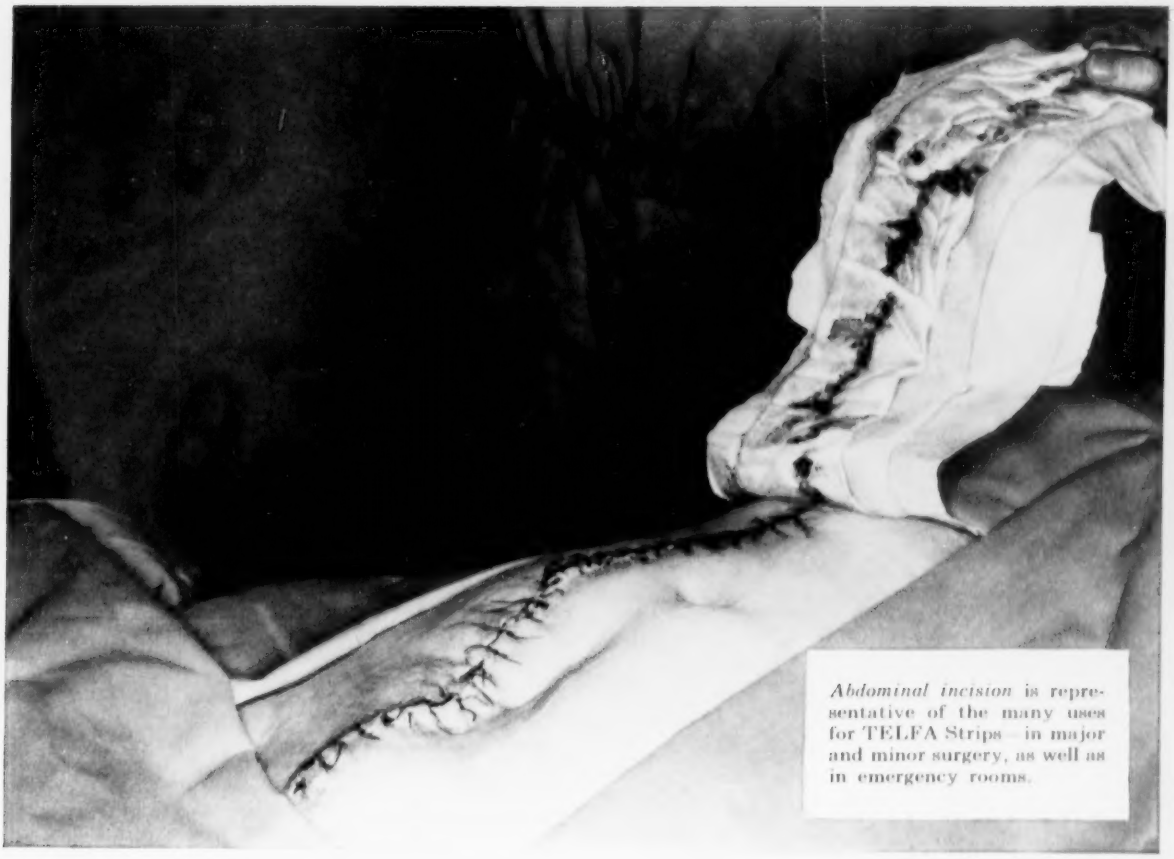
HEDWIG S. KUHN, M.D., and HUGH A. KUHN, M.D., will be among the representatives of the United States at the Third American Congress of Industrial Medicine in Caracas, Venezuela, the week beginning November 13. DR. HUGH KUHN is to give a paper there on "Traumatic Deafness," and DR. HEDWIG KUHN will address the Congress on "First Aid and Emergency Care of Eye Injuries." At the National Safety Congress in Chicago, October 17-21, DR. HEDWIG KUHN is presenting two papers—one, at the Section of Colleges and Schools, on "Eye Safety in Halls of Ivy," and the other, at the Paper and Pulp Section, on "Eyes—Facts and Fallacies." The Joint Committee of Industrial Ophthalmology is to have a scientific exhibit on "Eyes and Industry" at the Safety Congress. Later, the Joint Committee will send this same exhibit to Santiago, Chile, to be donated to the South American countries. This is in connection with the Pan American Ophthalmological Congress in Santiago in January, 1956, which the DOCTORS KUHN will attend officially. Meanwhile, DR. HEDWIG KUHN is giving an eight-hour course in Industrial Eye Problems at Ohio State University Department of Medicine, in a special course in aviation medicine, where she is on the faculty as Consultant to the Air Force and the CAA. Her course draws Medical Directors of commercial airlines, military officers, and aviation medical people from foreign countries.

THE ASSOCIATION of Teachers of Preventive Medicine will hold its 12th Annual Meeting, Sunday, November 13, 1955, in the form of a "Teaching Institute on Occupation and Health" at the University of Kansas Medical Center, Kansas City, Kansas. Keynoters are to be WILLIAM P. SHEPARD, M.D., who will speak on "Medicine and Industry—Some Expectations of Each," and RODNEY R. BEARD, M.D., who will speak on "Occupational Hygiene—A Vehicle for Teaching Preventive Medicine." There will be 10 round-table discussions on various applications of preventive medicine in industrial practice. At least two Resource Consultants will serve with each table. Among these Resource Consultants are: BERTRAND E. BENNISON, M.D., J. S. FELTON, M.D., H. GLENN GARDINER, M.D., LEONARD J. GOLDWATER, M.D., A. G. KAMMER, M.D., ROBERT A. KEHOE, M.D., D. J. LAUER, M.D., O. T. MALLERY, JR., M.D., J. WISTER MEIGS, M.D., SEWARD E. MILLER, M.D., ROBERT B. O'CONNOR, M.D., CARL M. PETERSON, M.D., JOHN J. PHAIR, M.D., NORBERT J. ROBERTS, M.D., WILLIAM P. SHEPARD, M.D., JAMES H. STERNER, M.D., IRVING R. TABERSHAW, M.D., C. RICHARD WALMER, M.D. At the dinner meeting at the Hotel Muehlebach, Kansas City, Missouri, on Sunday evening, DR. WILSON G. SMILLIE, Professor Emeritus of Public Health and Preventive Medicine at Cornell, will speak on "The Future of Preventive Medicine in America."

CARL M. PETERSON, M.D., 55, Secretary of the A.M.A. Council on Industrial Health, died at Hendersonville, North Carolina, Tuesday, September 27, 1955, from injuries received at about 3:00 A.M. the day before in the crash of a private plane on a mountainside near Asheville. The two crewmen were killed instantly. DR. PETERSON was asleep in the rear of the plane when it crashed and was not wearing his seat belt. He was thrown clear of the wreckage, and into a tree. He suffered extensive body burns and a broken leg, and was taken to Pardee Memorial hospital, Hendersonville, where it was hoped he might recover. He took a turn for the worse Monday night, and the end came Tuesday morning at 9:00.

INDUSTRIAL MEDICAL ASSOCIATION OF PITTSBURGH is holding its First Annual Meeting and Second Scientific Session, October 14, at the Pittsburgh Athletic Association. The program is as follows: "Opening Remarks"—J. HUBER WAGNER, M.D., Association President, Medical Director, United States Steel Corporation; "Welcome to New Members"—F. D. GASSAWAY, M.D., Chairman, Membership Committee, Medical Director, Gulf Oil Corporation; "The Epileptic in Industry"—FLOYD H. BRAGDON, M.D., Associate Professor of Neurosurgery, University of Pittsburgh School of Medicine. "Industrial Back Disability"—JOHN SPEER DONALDSON, M.D., Associate Professor of Orthopedics, University of Pittsburgh School of Medicine, and JOHN G. PIFER, M.D., Westinghouse Electric Company, Pittsburgh. FRANK E. GRAY, M.D., will preside at the Afternoon Session, which will feature a Panel Discussion on "Administrative Problems in Medical Fringe Benefit Programs," with S. J. LUBARSKI, M.D., Medical Director, Equitable Gas Company, Pittsburgh, as Moderator, and Panelists: DANIEL C. BRAUN, M.D., Medical Director, Industrial Hygiene Foundation; NEAL R. ANDERSON, Administrator, Employee Benefit Programs, Westinghouse Electric Corporation; W. F. McANALLY, M.D., Medical Director, Consolidated Natural Gas Company; and REX H. WILSON, M.D., Medical Director, B. F. Goodrich Company. After the Panel Discussion, WILLIAM K. SMITH, M.D., Team Physician, University of Pittsburgh, will speak on "Acute Sprains of the Knee and Ankle."

RALPH W. TARABA, M.D., has been appointed Medical Director of the Delco Radio Division of General Motors Corporation at Kokomo, Indiana. This appointment was effective August 4. DR. TARABA will be the Division's first full-time Medical Director, DR. T. J. BRUEGGE, local physician and surgeon, having served the Division since 1946. With the expansion of plant hospital facilities and employee medical services, DR. TARABA will devote full time to the administration of the Medical Department. DR. TARABA received his medical education at Northwestern University School of Medicine, where he was Bachelor of Science in 1938, Master of Science in Physics in 1941, Bachelor of Medicine in 1942, and Doctor of Medicine in 1943. He served his internship and residency at Passavant Memorial Hospital, Chicago. Graduate work was taken at the La Rabida Sanitorium for Cardiac Children at Northwestern University. Prior to his assignment as Medical Director at Delco Radio Division, DR. TARABA served as Assistant Medical Director at the Iowa Ordnance Plant, Burlington, from 1953, to June, 1955. He was engaged in private practice in Chicago from 1946 to 1953. From 1944 to 1946, he was industrial physician and surgeon, Commonwealth Edison Company, Chicago.



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Northwest Association

ON MONDAY evening, September 12, interested industrial physicians of the Northwest held an organizational meeting to consider the formation of a Northwest Association of Occupational Medicine. The meeting followed a dinner meeting sponsored by the Oregon Academy of Occupational Medicine and Surgery. DR. E. P. LUONGO talked at this meeting and was helpful in setting the stage for the formation of the Northwest Association. DR. LEONARD ARLING, and DR. WILLIAM P. SHEPARD, Chairman of the Council on Industrial Health of the American Medical Association, also offered helpful suggestions. The group voted unanimously in favor of forming such an Association and appointed a committee to draft a constitution and by-laws. On the following day the interested industrial physicians met and approved the by-laws and constitution and elected the following officers: President, EUGENE P. OWENS, M.D., Medical Director, Consolidated Freightways, Portland, Oregon; Vice-President, CHARLES M. MCGILL, M.D., Medical Director, Tacoma Smelter, Tacoma, Washington; Secretary-Treasurer, W. J. SITTNER, M.D., Chairman of Section on Industrial Medicine, Oregon State Medical Society, Portland; Member of Executive Committee, 1955-1957, FORREST E. RIEKE, M.D., Industrial Clinics, Portland; Member of Executive Committee, 1955-1956, B. C. SCUDDER, M.D., General Electric Company, Hanford Atomic Products Operation, Richland, Washington. The group indicated their desire to have the newly formed Association become a component of the Industrial Medical Association. They plan to hold the First Annual Meeting in Portland in conjunction with the Northwest Industrial Health Conference.

Dr. Will Lyon

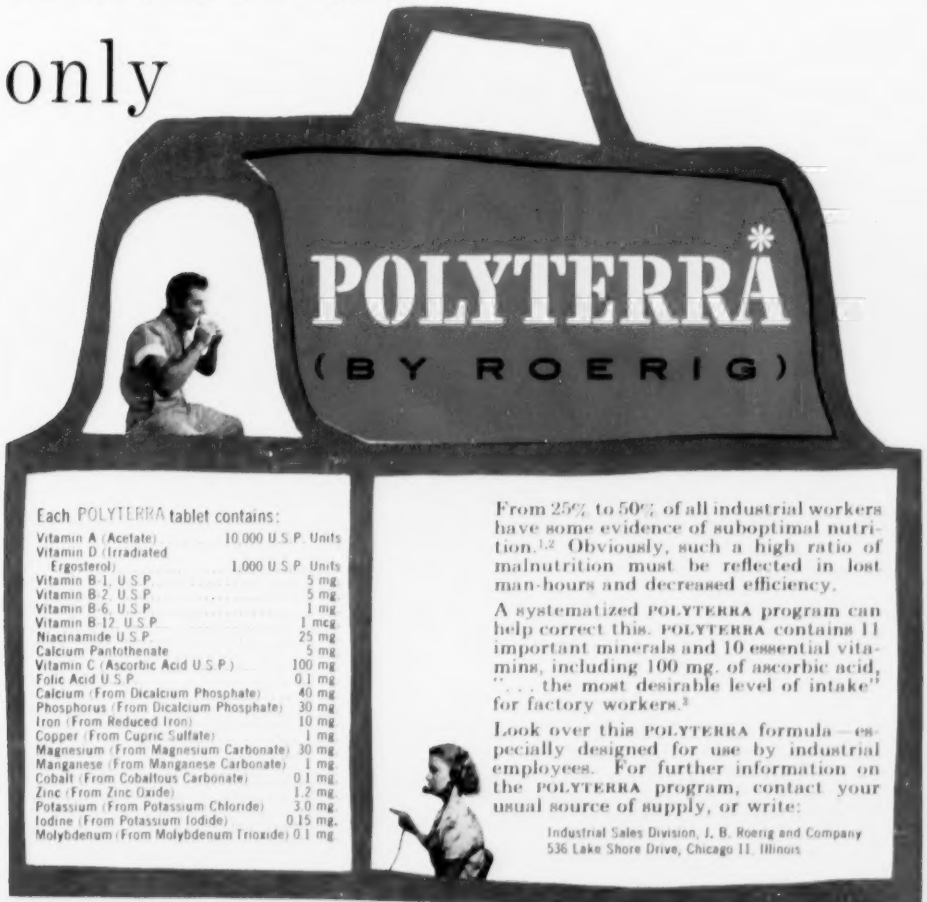
FOR 38 years, DR. WILL F. LYON looked after the physical well-being of International Harvester men and women. He retired, in the waning weeks of 1954, as Director of the Company's Medical Services. As much as any other man, DR. LYON had shaped and developed Harvester's elaborate Industrial Health set-up. His grateful company began casting about for a tangible way to express its appreciation. The upshot: the "DR. WILL F. LYON Annual Award." To be given over a period of 10 years, the annual prize consists of $300 in cash for "the intern at St. Luke's Hospital (Chicago) who, in the performance of his appointed duties, best exemplifies the high devotion and dedicated service which have characterized DR. LYON'S professional career." To the committee charged with selecting the annual winner, went this request: Be mindful of those qualities of mind and heart which were so characteristic of DR. LYON in his service to his patients, his company, and his profession. The committee's choice: young DR. GERALD J. KAVANAUGH, from Fargo, North Dakota, a 27-year-old intern who was not yet born when DR. LYON began his IH career in the coal-mining community of Benham, Kentucky. Said DR. LYON: "He is a charming, bright, capable boy. He will everywhere be a credit to St. Luke's and International Harvester.

—*Harvester World*, June-July, 1955.

"Their Honor and Their Toil"

GM FOLKS for July, 1955, carried the picture shown below, with the following caption: "Doctors live long at General Motors. Honored for service totaling 112 years were DR. L. J. BERG, Chevrolet Division, Tarrytown, New York; DR. R. L. JOHNSON, Inland Division, Dayton, Ohio; DR. PAUL J. OCHSNER, Fisher Body Division, Lansing, Michigan; DR. R. D. MUDD, Chevrolet Grey Iron Division, Saginaw, Michigan. At the left is DR. MAX R. BURNELL, Medical Director, General Motors Corporation; and at the right is DR. C. D. SELBY, former General Motors Medical Consultant."

new multivitamin formulated for (and sold to) industrials only



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Folic Acid U.S.P.	0.1 mg.
Calcium (From Dicalcium Phosphate)	40 mg.
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Copper (From Cupric Sulfate)	1 mg.
Magnesium (From Magnesium Carbonate)	30 mg.
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Cobalt (From Cobaltous Carbonate)	0.1 mg.
Zinc (From Zinc Oxide)	1.2 mg.
Potassium (From Potassium Chloride)	3.0 mg.
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From 25% to 50% of all industrial workers have some evidence of suboptimal nutrition.[1,2] Obviously, such a high ratio of malnutrition must be reflected in lost man-hours and decreased efficiency.

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Dosage: One tablet daily preferably with a meal, or as directed by industrial physician. Supplied: Bottles of 100.

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1. Babcock, M. J., et al: Milbank Mem. Fund Quart., 32:323 (Oct.), 1954. 2. McLester, J. S. and Darby, W. J.: Nutrition and diet in health and disease. W. B. Saunders and Company, Philadelphia, 1952, p. 584. 3. Pollack, H. and Halpern, S. L.: Therapeutic Nutrition, National Research Council, publication 234, 1952, p. 37.

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Reference: Hughes, W. M., Dennis, E., and Moyer, J. H.: Am. J. M. Sc. *229*:121 (Feb.) 1955.

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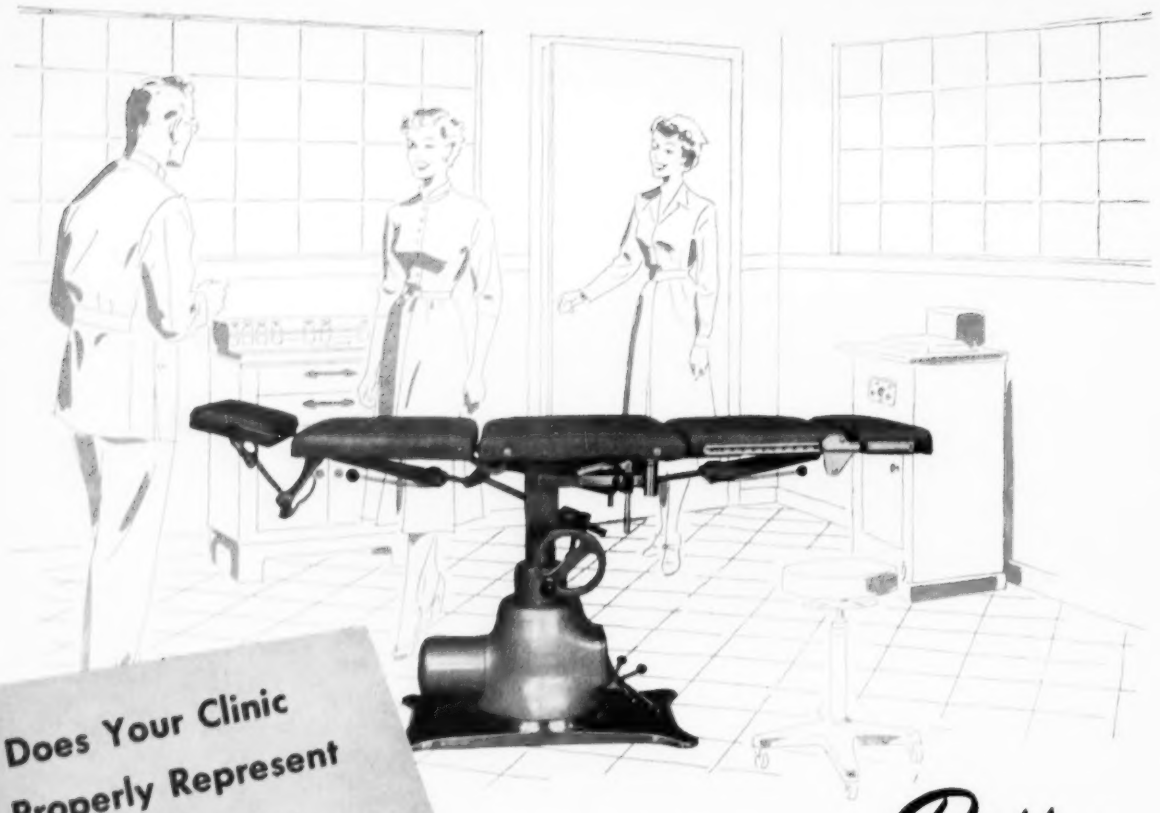

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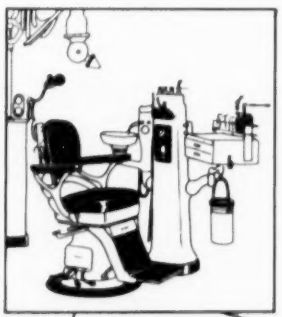

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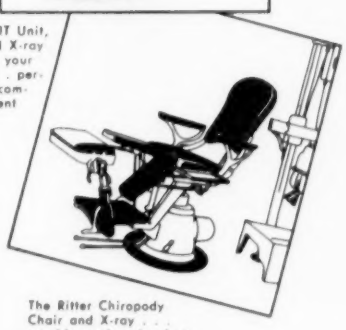

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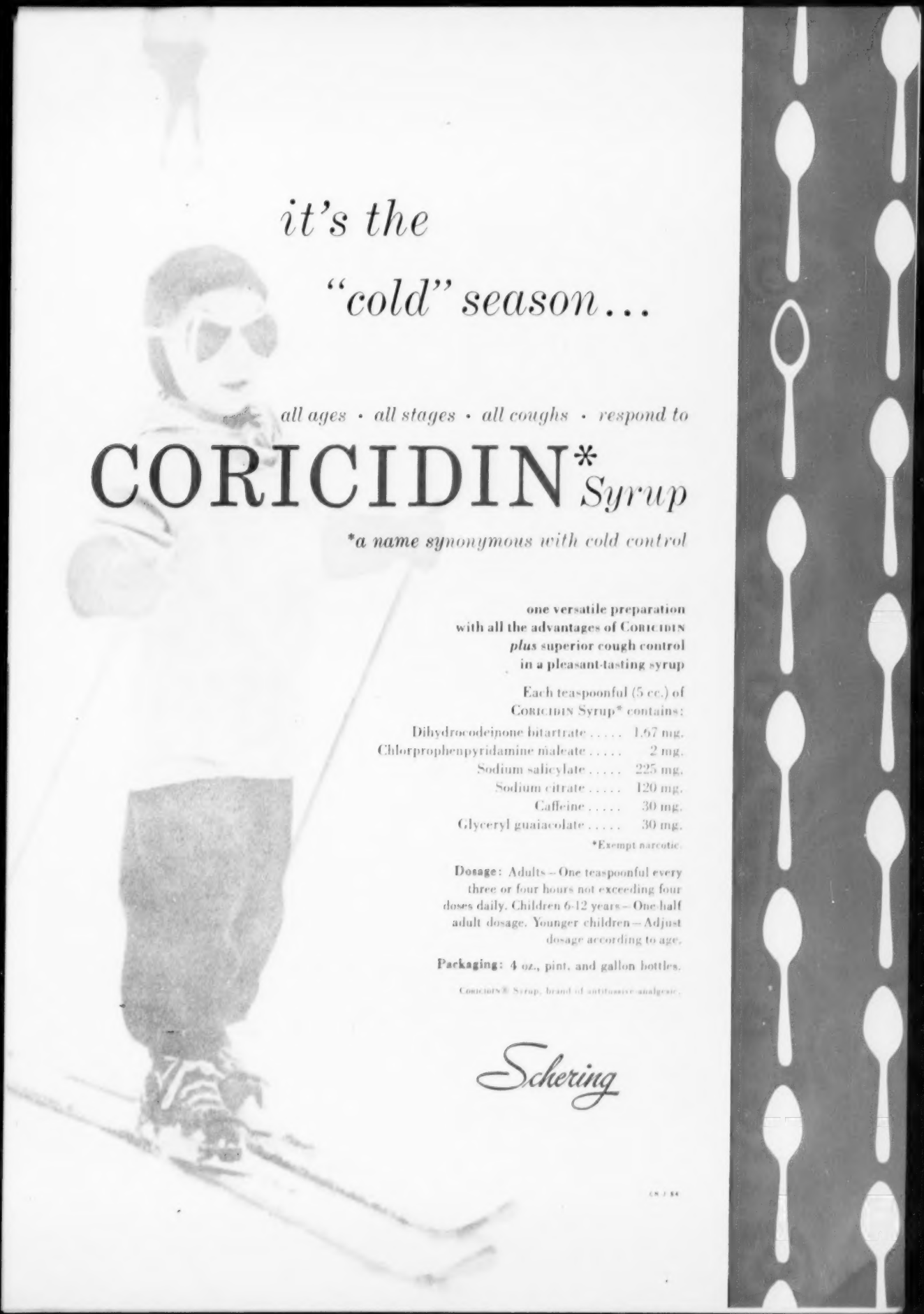

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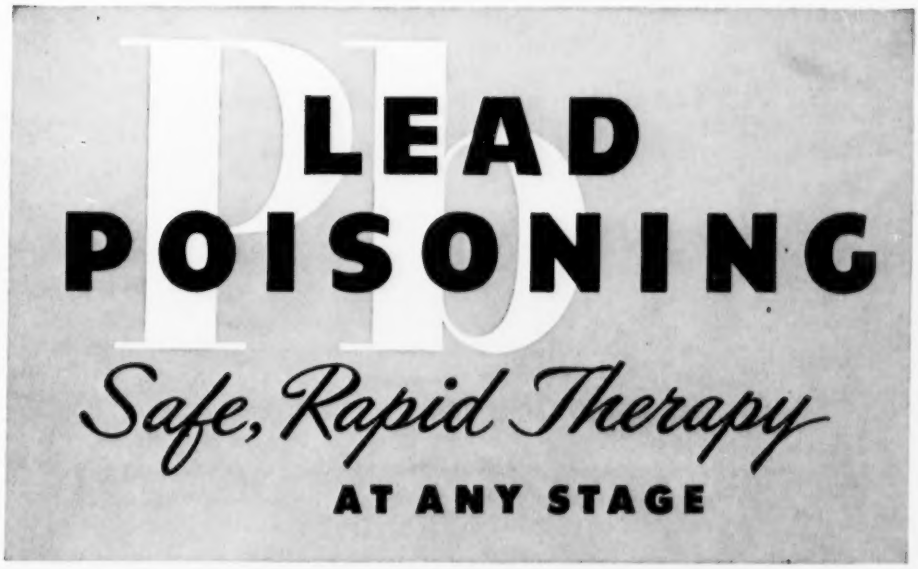

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1. Rubin, M.: Biological Action of Versene, from Symposium on Complexing Agents, presented at the University of Chicago, Feb. 27, 1951.
2. Sidbury, J. B., Jr., Bynum, J. C., and Fetz, L. L.: Effect of Chelating Agent on Urinary Lead Excretion; Comparison of Oral and Intravenous Administration, Proc. Soc. Exper. Biol. & Med. **82**:276 (Feb.) 1953.
3. Cotter, L. H.: Treatment of Lead Poisoning by Chelation, J.A.M.A. **155**:906 (July 3) 1954.
4. Bradley, J. E., and Powell, A. M., Jr.: Oral Calcium EDTA in Lead Intoxication of Children, J. Pediat. **45**:297 (Sept.) 1954.

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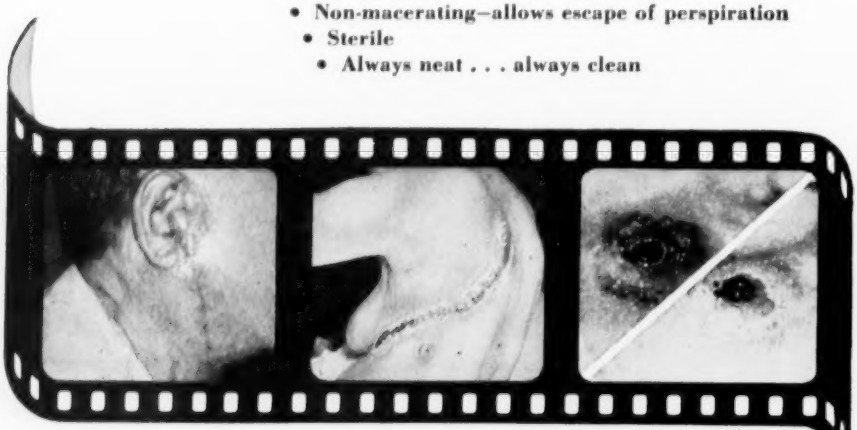

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Green, M.A.: Ann. Allergy *12*:273 (May-June) 1954

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1. Banyai, A. L.: Management of Cough in Daily Practice, J. A. M. A., 148:501, Feb. 16, 1952.

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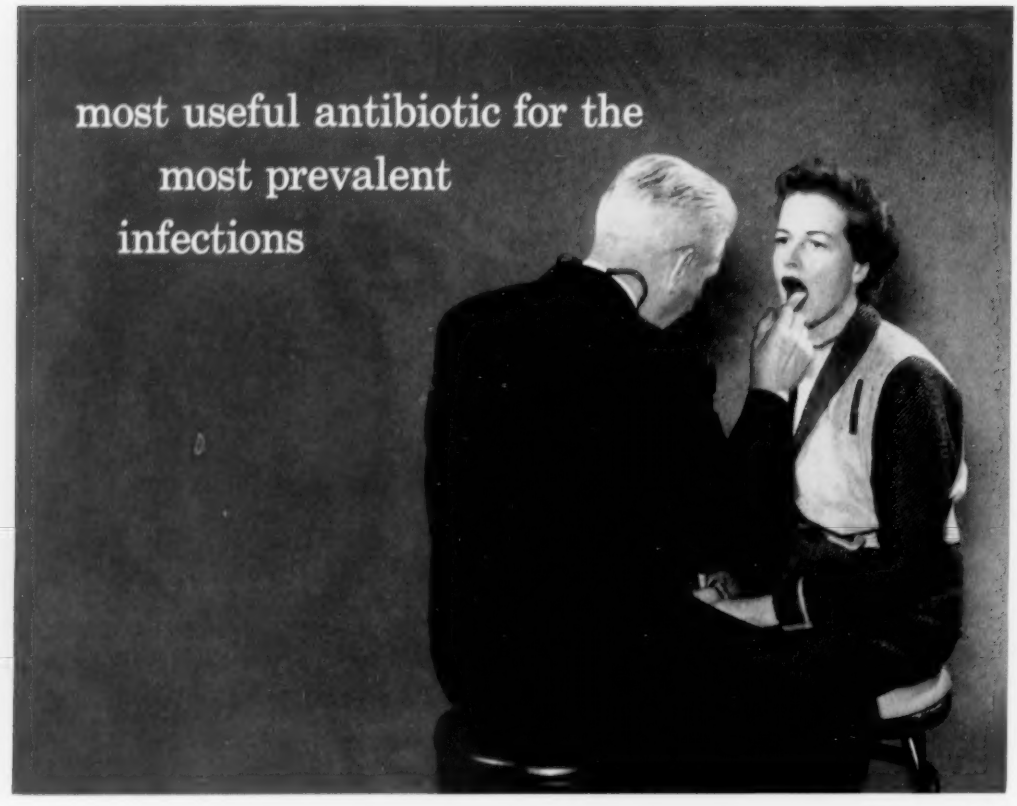

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INDUSTRIAL MEDICINE AND SURGERY

OCTOBER, 1955

Criteria for the Diagnosis of Occupational Illness

I. METALS AND OTHER INORGANIC SUBSTANCES

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INDUSTRIAL diseases have been discussed in the past, and will be again in the future, from a number of different viewpoints, such as that of the physician in general or private practice, that of the industrial physician, that of the employer, the labor organization, the compensation agency, whether public or private, and that of the courts of law. Under the influence of these varied interests, and of several activities that have grown out of them, the medical aspects of certain occupational diseases have tended to become submerged. The administrative and legal machinery which has grown up around compensation claims has often seemed to occupy the center of the stage, almost to the exclusion of the primary considerations of the definitive diagnosis of disease and the appropriate treatment of the workman that would return him as promptly as possible to his work. Other aspects of this situation, including the disconcerting spectacle of physicians lining up on opposite sides in heated professional and medicolegal controversies, present themselves to our minds at the mere mention of occupational disease. It is important, therefore, to recognize that the factor that lies at the heart of this confusion of tongues and of purposes is the incompleteness of our medical knowledge of occupational diseases, either because the nature of certain of them has not been elucidated fully, or because the known facts about them are not disseminated widely or generally among physicians, or for both of these reasons combined. Medical and legal controversy, in relation to occupational disease, tends to die a natural death when the etiologic diagnosis of such disease finds a firm basis in general medical procedure and practice. Our course then, as industrial physicians, lies in the development of diagnostic criteria that will stand up in the midst of critical examination, and in the achievement of an acceptance, among physicians generally, of the necessity of applying these criteria critically and regularly in the consideration of the occupational background of disease. Perhaps we can pave the way for our discussion of such criteria by giving some thought to their sources and origins, and by emphasizing the fact that an industrial medical problem is not solved by public discussion, popular vote, or legislation, or by controversies or decisions in compensation hearings or in courts of law, but by the careful and patient observations and the critical interpretation of these and other data, made by physicians and medical investigators in experimental laboratories, in industrial plants, and at the bedsides of sick industrial employees.

Some suggestion has been offered that in the serious consideration of the vexed problem of suitable diagnostic criteria, we might call the attention of physicians to the intellectual and scientific discipline represented in Koch's postulates. So far as these are applicable to chemical intoxications and injuries, the idea is sound. It should be recognized, however, that these criteria must be modified both in principle and in phraseology, when they are lifted from their basis in disease induced by the invasion of microorganisms into human tissues, and also that these postulates were formulated in relation to the identification of a *disease* in terms of its etiological agents, rather than with *diagnosis* in the individual case. Let us consider the rephrasing of these postulates later, and emphasize, at this time, the similarity of our present problem to that faced intellectually and practically by Koch, in his need to define a disease of bacterial origin. Our dilemma, from the diagnostic viewpoint, is that the disease induced by a chemical substance must have been thoroughly elucidated in its essential clinical, metabolic and pathological characteristics, and must be identifiable when it appears in the individual case, either on the basis of cer-

This Presentation, together with the succeeding ones—"Solvents," by DR. FOULGER, "Radiation," by DR. ALBERT and "Organic Materials" by DR. ZAPP—are from the "Symposium on Criteria for Diagnosis of Occupational Illness," at the Fortieth Annual Meeting of the INDUSTRIAL MEDICAL ASSOCIATION, Industrial Health Conference, Buffalo, New York, April 27, 1955.

tain of its entirely unique clinical characteristics, or by specific chemical means, or by some combination of both of these qualities.

The significance of the combination of these characteristics, as contrasted with that of either characteristic by itself, will appear at once, when one takes thought of the fact that the large proportion of the inorganic substances, with which one must be concerned in relation to occupational intoxications or diseases, occur naturally or commonly in traces or more in the animal organism, including that of the human being. The elements from which they are derived, are not, in themselves, necessarily injurious. Indeed in many instances they are essential to the continued life and well-being of certain animals and of man, and their causal relationship to disease is a matter of their quantity or of their concentration in an animal organism, rather than of their mere presence. In this respect they bear some analogy to the avirulent, harmless or beneficial microorganisms, or to those which, prior to their invasion into certain tissues, and their multiplication or their elaboration of specific toxins, are the incidental associates of their host. Both the latter and their chemical counterparts may fulfill Koch's first postulate and bring confusion to the investigator of an hitherto obscure disease or of the clinical problem of a single patient, as each has done before and will, undoubtedly, do again. The literal statement of this first postulate requires no modification to reveal its relevancy in both situations, and its peculiar shortcomings in relation to industrial intoxications. (*"The organism must be found in all cases of the disease in question, and its distribution* (this word has no necessary quantitative implication and would not ordinarily be vested with such implication) *in the body should be in accordance with the lesions observed."*) How frequently has the diagnosis of occupational intoxication been made or excluded, erroneously in both instances, because reliance was put upon the validity of logic adapted consciously or unconsciously from this postulate, without regard to the strictly quantitative information required to give it cogency!

But not to depart too far from the logical sequence of our discussion, let us return to the consideration of the industrial intoxications induced by inorganic substances as characteristic disease entities. To what extent can the immediate and remote manifestations of the absorption of injurious quantities of the inorganic forms and compounds of the following elements, which have been credited as having caused some form of occupational injury, be identified as specific and characteristic disease entities: aluminum, antimony, arsenic, beryllium, bromine, cadmium, chlorine, chromium, cobalt, fluorine, hydrogen, lead, manganese, mercury, nickel, nitrogen, oxygen, phosphorus, radium, selenium, silicon, sulfur, thallium, tin, uranium and zinc?

True, the experienced toxicologist or industrial physician, and many other physicians as well, will think of certain more or less specific types of disease which are known or believed to be associated with these elements, as they have been named one by one, and one's first impression, quite properly, is that through our collective recorded experience over many generations, we have gathered together a very considerable body of clinical information concerning them.

Among these items are acute and chronic forms of systemic intoxication, fairly characteristic individual lesions, specific tissue reactions, specific lesions involving the skin, the skeleton, the blood-forming tissues and other organs, not excluding benign and malignant tumors. Yes, our knowledge is extensive and growing. But in all of this welter of information, what is the total pattern of the injurious effects of any one of these elements, as expressed by the term occupational disease? How many of these elements can be followed through the maze of their biochemical and metabolic combinations in the animal organism, even in a relatively simple, straightforward, descriptive sense? In how many instances could we, in consequence of such knowledge, accept a physical sign as specifically significant, or apply a specific microscopic or chemical test or series of tests to an available tissue or body fluid at such a point and in such a manner and at such a time as to obtain unequivocal evidence of the existence or probable existence of a specific disease?

There are a few of these, of which it is fair to say that we have enough, or almost enough, information with which to deal effectively with the diagnostic problems that arise. But their very fewness and the limited availability of the precise information and the facilities for dealing with them demonstrate clearly the essential nature of the problem with which we are dealing when we attempt to remove this phase of occupational medicine from fields of controversy in which ignorance is at a premium, and opinion tends to be respected in proportion to the loudness of the voice that expresses it. The essential remedy for this situation, then, as has been implied previously, is the extension of physiological, toxicological, pathological and clinical research so as to cover the field.

How have these criteria been supplied in the past, and how are they to be developed further? The means suggested—physiological, toxicological, pathological and clinical, as well as epidemiological research—require some elaboration, since it is taken too much for granted that these means are available and that they are being employed effectively. Unfortunately this is not entirely true, for we are just beginning to recognize our great dearth of the facilities and the resources in trained personnel and funds that could meet our needs.

We might refer here again to Koch's postulates, just to keep our vision clear. We may well dismiss his second postulate, since it relates only to the problem of disease induced by microorganisms. (*"The organism must be shown to be a living thing, and must be cultivated outside the body of the original host in pure culture."*) It would appear that the only derived relevance of this principle to our present subject lies in the neces-

sity of demonstrating that an occupational intoxication or injury stems from a pure element or a compound thereof, rather than from some other substance with which it is commonly associated as a minor or trace impurity. This, of course, involves the elaboration of highly specific and adequately sensitive analytical procedures. One needs not emphasize the fact that serious and even famous errors of this type are known to have been made. The third postulate, however, is pertinent. ("*The organism so isolated, must reproduce the disease in other susceptible animals.*") Translated into its simplest form and most direct application, this postulate brings us to the investigations of the toxicological laboratory. In its broader application to appropriate methodology, however, it must also include critical clinical investigation—the delineation of the characteristics of the disease induced by a specific environmental factor which can be and has been "isolated" by adequate means from all other environmental factors. For the sake of completeness we must recognize that this isolation "by adequate means" involves the use of specific techniques for the physical or chemical, as well as the epidemiological, appraisal of the environment. These techniques for the investigation of occupational disease of inorganic chemical origin, as differentiated from those which result from the invasion of microorganisms, have yielded sound and sometimes brilliant results. What they require is fuller development and broader application. The criteria that will apply in the interpretation of the individual case of injury or illness or disease, and so would serve the purposes of this discussion or of the day's work, are yet to be developed, except in a few instances. But so that we may develop some concept of what these may be, in principle, it will be both convenient and useful to examine the situation under headings which correspond to the conventional components of a diagnostic regimen as this involves occupational disease.

The History of Exposure

EXPOSURE TO INORGANIC CHEMICALS IN INDUSTRY: Students and practitioners of medicine are being enjoined constantly to inquire into the occupational histories of their patients, and so they should, lest they neglect altogether this not infrequent source or background of human illness. However, let us face the facts. This source of information is fraught with grave weaknesses. It is only rarely that the patient knows enough of the nature of the hazards of his work to provide satisfactory answers to the questions put to him, and it is even rarer that the questioner knows enough about industrial processes to ask intelligent questions. The result of such interviews is that the blind lead the blind—one species of the blind asks leading questions and another (blindfolded by the ignorance of a little knowledge, by hearsay information from associates, or perhaps by resentment) is induced to give answers which only by chance tend to resolve the diagnostic problem. Thus we must urge the physician to be wary of such information, and to regard it only as a clue (or clues) to be investigated further. As Johnstone[1] has pointed out, this is almost the only situation in modern medicine in which the physician often allows the patient to make his own diagnosis. It is true, of course, that the patient with an acute upper respiratory or pulmonary irritation, of which the physical signs are fairly characteristic, can often provide the necessary information concerning the exciting cause of his distress in relation to an incident or an accident in his recent occupational experience. It is also true that he can often tell his physician, and often erroneously, the precise time, place and circumstance which gave origin to his illness. Nevertheless only the truly ignorant and inexperienced physician should reasonably be expected to accept the opinions of his patient in these matters without question and without the corroborative support of better and more objective information.

The questions to be raised, and to be answered, if possible, by expert questioning, based upon a knowledge of the specific industry and its operations, or to be inquired into critically by other means than that of questioning the patient, are:

1. To what substance or substances was this patient exposed; and

2. Was such exposure sufficiently intense, in severity and duration, to induce illness?

These questions, if raised by the physician in the properly objective frame of mind at any point in his initial inquiry, are not designed to support an hypothesis generated by the apparent character of the illness presented but not yet explored systematically by clinical means. Rather, they are set out by the physician, in complete openness of mind, as an independent facet of a diagnostic problem to which, most likely, the wrong solution will be obtained unless he undertakes carefully to avoid being misled. This viewpoint on the part of the physician is worthy of emphasis, since it is so clear that the frequent, if not the customary, viewpoint of the non-industrial physician, in relation to occupational disease, is the exact opposite. Men who are capable and cautious in their approach to other clinical problems commonly lose their way and arrive at diagnoses of occupational disease by intellectual and professional processes that hark back to their immature student days. And why? Essentially because they really believe that they, and physicians generally, have extensive knowledge of occupational disease, and that the important conventional step in the diagnostic process is to link the patient, by history, to his industry. The utter absurdity of this is revealed by the most superficial examination of modern industry in any field of production. The complexity of the processes, the changes that take place in them at frequent intervals, the divisions of labor within them, the isolation therein of occupational groups from each other, and, in particular, the variability of industrial plants within the same industry from the aspect of the extent and efficacy of their safeguards against hazardous exposure—

all of these things militate against the possibility of the exercise of any judgment of the significance of an occupational history on the part of any physician, excepting as he is acquainted with specific plants and processes or can obtain second-hand information from reliable sources.

How, then, are the answers to our questions to be obtained? First, by the recognition of the fact that the answer does not lie in inquiry of the patient. Much can be learned from him if one knows enough about his specific type of work to ask the right questions, but if this is not the case, the entire inquiry must be made elsewhere. It is reasonably certain that someone within the industry will know some of the answers, and it is increasingly likely, in these days, that most of them will be known. If there is a plant physician, a nurse, or an industrial hygiene engineer, the initial step in the inquiry will readily be made, and it may well be that the entire problem of the nature and significance of the occupational exposure can be settled quickly and firmly. It is a sad commentary on clinical medicine and on professional relations in general, that the physician in private practice so often fails to avail himself of the help of his colleagues in industry. The ordinary canons of self interest, not to mention those of simple courtesy, would seem to promise improvement in this situation. There are, however, other points of attack on the problem, such as the community health authorities. Useful information will often be available from this source, at the price of a telephone call or at most a letter, and if it is not available at once, it can often be obtained later as a part of the official functioning of such an agency.

A second and increasingly adequate means of determining the significance of an alleged or suspected type of occupational exposure to chemicals is to be found in the objective examination of the patient, in special relevance to a number of the metals and certain other mineral substances, by analytical means. This, however, is strictly within the regimen of clinical examinations, and thereby we come to our second heading.

The Examination of the Patient

THE CLINICAL RECOGNITION OF SPECIFIC OCCUPATIONAL DISEASE:

PHYSICAL EXAMINATION:

This is not the time or place in which to discuss or even mention the details of a physical examination in relation to the diagnosis of occupational disease. One should emphasize the fact, however, that this step in the diagnosis differs little from that of any other form of disease. Clearly, the patient as a whole should be examined thoroughly, and lest this statement should have the flavor of naivete, let me hasten to say that this type of examination is often omitted, and that, still more often, the findings, positive or negative, are interpreted hastily and unrecorded. The reasons for this are varied, but at least two of them are worthy of mention. One of these we have referred to before in speaking of the history of exposure, in that the patient succeeds all too frequently in planting his own idea of the nature and origin of his illness. Once this idea has been adopted, it tends to occupy the stage to the exclusion of opinions based upon the customary methods of clinical investigation. The patient's opinion of the nature of his illness is also reinforced to the extent of its apparent or actual adoption by his physician, and from this time on there is likely to be a strong emotional bond between patient and physician in resisting any other interpretation of the situation.

The second factor, which reacts upon the first and is often the primary background of the difficulty, lies in the completely unrealistic attitude of most compensation agencies toward the problem of occupational disease. In general the assumption of such agencies, as revealed in its practice, is that the diagnosis of occupational disease is made easily and finally without much expenditure of time and effort in clinical study. For this reason, the provisions for medical reports and for the compensation of the physician for purely diagnostic service are entirely inadequate. The entire procedure invites slipshod diagnostic methods, and provides many capable physicians with good reason for steering clear of compensation cases. Some others who provide good medical service in such cases do so in spite of the handicaps with which they must deal, in the feeling that this is an unavoidable evil with which they must contend in the performance of their professional duty.

The scope of a good physical examination might well be the subject of a prolonged discussion. Suffice it to say here that this is no plea for the creation of an elaborate record of the observations of a series of specialists, although certain supplemental or corroborative examinations of this type may be required as a matter of sound professional practice. There is every reason, however, for a systematic survey of the entire body, the integument, the head, the neck, the special sense organs, the chest, the abdomen and the extremities, with particular reference, in the latter, to neuromuscular abnormalities and dysfunctions. This should not be beyond the competence of any good physician who is prepared to take the time to employ his skill in the conventional elicitation of information.

Individual physical findings or combinations of findings may provide highly suggestive evidence of the etiological background of an illness. More frequently, however, such findings may suggest multiple causes, so that the differential diagnosis depends upon the careful analysis of the available clinical data and then, frequently, on obtaining additional information. Sometimes this additional information must come from a re-examination of the environmental or occupational situation. All too often this is neglected in favor of data from the clinical laboratory. It has often been pointed out that the resort of the diagnostician to clinical laboratory procedures has become a fetish, and since the trend in this direction has increased, one can hardly fail to emphasize the fact that undue and uncritical dependence upon

the clinical laboratory continues to be a serious source of error. This is peculiarly true of the procedures of the laboratory which are involved in the diagnosis of occupational disease, as we shall see later, but our purpose at this point in our discussion is to stress the importance of the careful analysis of the physical findings on the background of all of the medical history which can be obtained from the patient or from previous medical records, or from other sources such as his living and working environment. And here something must be said about arriving at a diagnosis by the process of exclusion. This may be done in many instances and in a variety of ways, and it is both a logical and a necessary procedure. However, it is a matter of common experience that this is often said to have been achieved when it has not actually been done on the basis of any cogent fact or valid evidence but merely by preference or even in some instances by whim. It is apparent that one may be compelled by circumstances to arrive at an opinion which cannot be proved or disproved. He should be aware of it, however, when this is the case, and act and speak and write accordingly.

EXAMINATIONS AND DETERMINATIONS IN CLINICAL AND X-RAY LABORATORIES:

No more can we describe or discuss, at this time, the procedures and findings of the laboratory in relation to the diagnosis of occupational disease than we could those of the physical examination. Nor is this so necessary to the understanding of our situation, as is the general consideration of a few principles. There is great confusion of mind among physicians generally as to the choice of laboratory procedures and the interpretation of the results, in the given case. Let us admit at once, that it is asking much of any physician—too much, in fact—to expect him to have a knowledge of the details of the toxicology or the broad potentialities for human injury of the many inorganic chemicals used in modern industry. A satisfactory grasp of what is known of one phase of this problem—that of the metabolism of the minerals—as well as a reasonable comprehension of the huge voids in our knowledge of this matter, may represent the achievement of a lifetime, if such actually is ever achieved. The assimilation of this information, to the extent of its applicability to diagnosis, might seem to be simpler. But actually it is not, since what is involved is not only the understanding of the whole body of our knowledge, but also the critical selection of the one procedure, or the few, that will disclose the answer in the case under consideration. This requires a high type of intellectual effort applied attentively and critically, rather than in the casual manner of the requests made of the clinical chemist, microscopist, radiologist or other specialist. How often is some sample of blood or other body fluid or tissue sent to the laboratory with the request that it be examined for a specific poison, or (sic) "for poisons!" Or, how often is the radiologist asked to look for signs of "heavy metal poisoning" in the skeleton of an adult! It is sufficient evidence of our confusion of terms, perhaps a forgivable one, but nonetheless symptomatic of our lack of critical thought, as well as our almost general "sloppiness" of speech, when this request is made in the case of a small child, for here one is seeking evidence not of the intoxication induced by certain metals, but of their absorption into the skeleton. But not to react intemperately to the common irritations of the day's work and not to be too unsympathetic with the serious difficulties with which all of us are confronted, we should attempt to clarify our thinking and action in these matters along certain general lines, since these difficulties are destined to increase in this general field of medicine.

There are three considerations, one general and the others special or secondary, which may guide us somewhat, and contribute materially to the adequacy of our efforts.

1. The diagnostic work of the laboratory in this field of medicine can be designed and carried out and interpreted satisfactorily only under the direction of trained and experienced specialists. Such specialists must prescribe the type of examinations which are to be made in the specific instance, the materials which are to be obtained for examinations, and the time and manner of obtaining them. In many instances they must supply the containers and the instructions or the supervision required to insure that the examination will not yield false or misleading results. What is required is nothing less than a professional consultation. The time has passed when, in relation to the diagnosis of an occupational intoxication, a sample or specimen of some kind can be sent to a laboratory for examination or analysis, or when the patient can be sent without the information, concerning current therapy, for example, on which the appropriate examination can be made and the results interpreted. The failure here to achieve the proper relationships among professional personnel is one of the most serious of our problems. The work of the laboratory is done irresponsibly, unproductively, and wastefully in every sense of the word, unless all of the necessary information about the patient is provided. Moreover, the clinician, instead of being aided in his task, is altogether likely to be misled by false or irrelevant results, and indeed he is much better off without any information from the laboratory, unless he can be utterly certain of its pertinence, validity, and significance.

2. Within the laboratory itself the choice of procedure and method must be made in strict conformity with the best toxicological, chemical and physiological information available, with particular reference to its specificity, its limits of sensitivity and reproducibility, and its applicability to the solution of the diagnostic problem presented.

3. The interpretation of the results of the examination must be made, in most instances, and should be made in all, by the responsible specialist in this medical field, on the basis of his knowledge of the validity of the results and of their meaning in relation to illness, disease or dis-

ability. The results of laboratory examinations may not be helpful toward a diagnosis, and unfortunately our knowledge of their meaning is often inadequate, but the interpretation should always set forth these limitations, to the end that their diagnostic meaning will not be missed, on the one hand, nor their irrelevance or insignificance go unrecognized on the other. Our greatest error as physicians in these matters is that of assuming a knowledge which we do not have. The presence in the body, or in the excreta, of potentially harmful materials without reference to their quantity, or the presence of known concentrations, however precise they may be, without the toxicological or physiological or epidemiological information that will enable us to relate such quantities to health hazards or to disease, is almost always meaningless for diagnostic purposes. This simple truth, introduced into practice, would not only save us from many errors of judgment and from many troublesome and costly controversies, but would also provide the stimulus for the experimental work that would dispel our ignorance.

Summary

ANY ATTEMPT at summarizing this discussion will lead, in all likelihood, to its over-simplification, while the effort to derive from it such criteria as would serve as rules of thumb for the diagnosis of the class of diseases with which it has been concerned, is obviously futile. Three general statements may serve to provide some semblance of topical coverage.

1. The appraisal of the history of occupational exposure to chemical substances, as supplied by a patient, is a difficult and virtually impossible procedure, unless one has specific and adequate knowledge of the relevant conditions under which the patient has been working. Such information can be obtained only rarely from the patient, and, therefore, it must be sought in an appropriate investigation of the environment, either at first- or second-hand, or, when it is feasible, by the use of suitable methods of clinical and laboratory investigation of the patient himself.

2. The clinical investigation of the patient involves the exercise of meticulous care in the elicitation of a complete medical history and of all of the information that can be obtained by a thorough physical examination, supplemented by the examinations of specialists as required, including, especially, those skilled and adequately informed and equipped in the pertinent techniques of the chemical, microscopic, and x-ray laboratories. These special requirements of the diagnostic regimen, as differentiated from that applicable to certain other types of cases, relate to the comprehensive background of physiological, toxicological and clinical knowledge on which its successful outcome must be based.

3. Inasmuch as the acquisition of the comprehensive clinical, toxicological and epidemiological knowledge of the industrial intoxications and diseases is a special responsibility of the industrial physician, the formulation and the substantiation of the diagnostic criteria for such diseases lie in his special province. The clear recognition of this professional duty, and the forceful presentation to industrial management of its challenge, should lead to the provision of facilities for the fundamental physiological, toxicological, pathological, clinical and epidemiological investigations required to develop such criteria. The relationship of these matters to the prevention of occupational diseases of which we are now aware, and of those which may appear on the future horizon, is self-evident.

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II. SOLVENTS

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EVERY diagnosis of industrial injury by chemicals can produce medicolegal problems which must be considered in any complete discussion of diagnostic criteria. These problems increase in complexity with lack of information, difficulty in differential diagnosis, or popular, but inaccurate, generalization on toxicological properties of chemical types. All these factors are found in our present subject of criteria for diagnosis of occupational diseases caused by exposure to solvents.

The term "solvents" covers an increasing number of substances—from simple alcohols and esters to relatively complex compounds such as cyclohexyl derivatives, or diphenyl oxide. Unfortunately, no member of this large group has been the subject of such monumental research as that which Dr. Kehoe has personally directed on the problem of lead for more than 30 years. Nor has there even been such an intense study as that made in recent years on beryllium. There are good reasons for this. It is one thing to investigate the pharmacology of inorganic elements which, while they may move around in the body and from time to time be associated with a variety of acid radicals, or even with proteins, fats or carbohydrates, yet still retain their intrinsic identities. It is quite another to study the action of organic compounds which, after entering the body, may be excreted rapidly or may be completely or even partially broken down. Our information on the details of pharmacological action of solvents on the human body is at present woe-

fully deficient and, for very practical reasons, I am afraid it will remain deficient for many years.

Differential diagnosis between the clinical pattern caused by too great exposure to solvents, and that produced by too great exposure to other synthetic organic compounds, including those used as medicaments, is difficult.

Such faulty generalization as "chlorinated hydrocarbons damage the liver," or "benzol derivatives injure the bone marrow," also, make for confusion.

Solvents are usually liquid at room temperature. Over a rather narrow range of temperature they can take up as solutes other organic or inorganic compounds. The value of a solvent as a solvent usually depends upon ability to differentiate between one solute and another and so to allow separation of desired from undesired products of a chemical reaction. In the act of solution, the solvent must be inert with respect to its solute. Under conditions which do not change this inertness and do not damage the solute, the solvent must be removable as vapor by an increase in temperature, a reduction of pressure, or both. Usually, for economic reasons, the solvent must be recovered in a suitable condenser system.

It is a fundamental property of solvents that over an ordinary temperature range they exert significant vapor pressure. Vapor is always present above them and can diffuse from open containers or leaking equipment into the atmosphere of the workroom and may be inhaled by those working there.

The stability of a solvent with respect to its solute may not hold with respect to other compounds or physical conditions present in the workroom. Hot metals or exposed flames may break solvent vapors down to form more highly hazardous compounds. Other chemical material, exposed in the room, may change the solvent vapors.

Solvents can enter the body by passage through the skin, or via the digestive tract. They may have a local action on the skin or mucous membranes. However, in industrial practice, the primary route of entry, and that most important in consideration of injury, is through the lungs.

The stability of solvents with respect to their solutes does not necessarily imply stability in the human body—in fact it may rarely do so. Oxidation-reduction processes in tissue cells can achieve changes in solute molecules at body temperature of a type and to a degree not easily produced in a test tube. The energy involved in such changes, the diversion of biochemical reactions from attention to ordinary physiological processes to the sudden necessity for combating foreign chemicals can have important results. The products of such changes can offer new hazards. Thus, from the chemical point of view alone, inhalation of a solvent vapor can have varied consequences. For this reason, the determination of the quantity of a solvent in the body, or of a known metabolic product in the excretions, or in exhaled air cannot be so clearly correlated with a clinical pattern of injury as can quantitation of an inorganic element such as lead in the blood stream or in the urine.

Determination of the concentration of solvent molecules in blood or urine, or by-products of metabolic breakdown of solvent molecules, can seldom indicate more than that a worker has been exposed to the solvent within a reasonable period of time before the chemical analysis was made.

From a physicochemical point of view, also, we face complexities. Inhaled vapors will enter the blood stream in proportion to the vapor tension in the alveolar air and solubility in the blood. In any given period of time, the absolute quantity of vapor entering the blood stream will depend upon the volume of arterial blood flowing through the lungs and the surface of the lungs available for passage of vapor to the blood. The degree of physical activity of the exposed worker controls his respiratory rate and his cardiac output. His body size determines the total mass of blood which can pass through the lungs. Both will greatly affect the rate of uptake and certainly the extent of uptake of the solvent vapor. The solubility of the solvent vapor molecule in the body tissues and the extent of its breakdown there to other compounds, volatile or non-volatile, will influence the speed with which the blood is saturated and, therefore, the total period of entry of new vapor molecules into the body. The metabolic status of the exposed worker at the time of first entry of the blood-borne solvent molecule into the tissues can, also, be important. The degree of integrity of the body organs to which the blood carries the vapor molecules can markedly influence the response of these organs to foreign materials.

These factors are not cited to add insuperable difficulties to our search for criteria of injury. They must be considered in every case of alleged poisoning by solvent vapors. In each such case, therefore, in addition to obtaining the usual data on age, height, weight, we must answer the following questions:

1. Was the worker, in fact, exposed to vapors of the solvent?
2. What was the concentration to which he might have been exposed?
3. How long did the exposure last?
4. What was his degree of physical activity during the time of exposure?
5. What was his condition of health at the time of exposure?
6. Had he any recent, or even remote clinical history of abnormal function, especially of the central nervous system, respiratory or cardiovascular systems, or of the kidney or of the liver?

Having established the fact and conditions of exposure, we now consider the possible pattern resulting from it. Except for a few compounds, such as carbon bisulfide and benzol, we can recognize no specific picture of physiological effects of solvent vapors. Most of our information concerning them has been gathered from laboratory animals in which clinical patterns are not easily definable. But many studies of industrial workers, also, have failed to disclose a pattern except in those rare instances such as carbon bisulfide and

benzol. Therefore, despite our stated objection to generalization, we must, in this case, use generalizations in describing the expected physiological effects of inhaled solvent vapors.

When a vapor is inhaled, a large portion rapidly reaches the central nervous system. Here lie those cells most sensitive to interference with oxidation-reduction processes. This interference rapidly leads to activity of the autonomic nervous system which may affect respiration and, particularly, circulatory functions.

Another large part of the inhaled vapor will soon reach the liver and come into intimate contact with functional liver cells. Another portion goes to the kidney.

Thus, three important systems and two major organs can be affected. The respiratory and cardiovascular systems respond to change in autonomic balance caused by action of the inhaled chemical on the central nervous system. In acute exposures, unless so intense as to cause pronounced cerebral anoxia bordering on asphyxia, the systemic blood pressure tends to fall. There is now good reason to believe that as a result of autonomic imbalance there may be a rapid reduction in the blood supply to the liver and to the kidneys. These organs are very susceptible to hypoxia. At the same time, the functioning cells of both liver and kidney may be further insulted by direct action of that part of the inhaled chemical which is carried to them by the blood stream.

In our own studies over the last 10 to 15 years, we have found that statistically significant changes in arterial blood pressure are among the earliest signs of important exposure to vapors or gases both in dogs and in workers in our own chemical plants. In a majority of acute toxicity studies made on small animals, the liver and kidneys are the organs most frequently showing significant weight changes or significant pathology. The two are quite often affected at the same time. A recent cursory review of some 60 chemicals, not all solvents, known to injure the liver or to interfere with its function, showed that 40 are noted also to affect the kidney.

We would emphasize, therefore, that the systems and organs most likely to be affected by exposure to inhaled solvent vapors are the brain, the respiratory and cardiovascular systems, the liver, and the kidney.

The functional changes following inhalation of solvent vapors lead to a pattern of symptoms which is more or less complete in all significant exposures. It includes headache, nausea, and perhaps vomiting, dizziness, increased dyspnea upon exertion, unusual fatigue. In very severe cases, there may be epigastric or precordial pain, pain or numbness or tingling in the extremities, or pain in the back of the neck. We consider these pains to be highly important, for they often indicate myocardial ischemia due either to direct action upon the heart muscle or to serious interference with circulation. While it is our opinion that the majority of these symptoms arise from initial interference with the central nervous system, it is only in extreme cases that that system is markedly deranged. When this occurs, there may be semi-coma or coma preceded, perhaps, by muscular incoordination, visual or speech defects, or mental disorientation.

We believe it to be an accurate generalization that in adequate concentration, varying between 3000 and 14,000 parts per million by volume, all solvent vapors may be narcotic. As a yardstick by which roughly to assess the possible intensity of an exposure it should be noted that at room temperature each millimeter of mercury vapor pressure exerted by a solvent represents a concentration of 1300 parts per million by volume of vapor in the saturated air close to the liquid.

In acute exposure to high vapor concentrations, the rapid and pronounced fall in arterial blood pressure may lead to syncope.

Removal of a worker from a contaminated atmosphere will in mild cases result in rapid disappearance of symptoms and in recovery of systemic blood pressure. This end can often be obtained more rapidly if oxygen is inhaled.

Continuance of physical activity after removal from the contaminated atmosphere may prevent recovery and even have serious consequences. These partially stem from cardiovascular malfunction. Thus, sudden deaths while riding a bicycle or "bedpan" deaths have occurred in Europe when physical activity or straining at stool have followed episodes in which, apparently, exposure to the vapors of a commonly used solvent has caused no more than dizziness.

Continuation of exposure or repeated acute exposure to relatively high concentrations, even short of producing semi-consciousness, can lead to centrilobular necrosis of the liver and kidney malfunction which may reach complete anuria. If not handled adequately, these can be fatal.

Liver and kidney injuries are not specific for any type of solvent. Given proper conditions, any solvent vapor can produce them. It merely happens that chloroform, tetrachlorethane and carbon tetrachloride produce these injuries easily; trichlorethylene and perchlorethylene very much less easily, and vapors of aliphatic hydrocarbons with great difficulty. The ease of production of this type of liver injury depends upon factors in the clinical history of the exposed worker. Previous liver damage of certain types (massive hepatic necrosis or diffuse hepatic fibrosis) may increase the sensitivity of the liver to solvent vapors. Intemperate use of alcohol may definitely affect the reaction to carbon tetrachloride and other chemicals. Malnutrition may be important in deciding the degree, nature and persistence of liver injury.

Prompt attention, even after severe acute exposures, can prevent serious extension of centrilobular necrosis of the liver and there can be complete healing in a relatively short time. Prompt attention, also, can restore kidney function to normal even though, after an acute exposure, complete anuria has developed.

Finally, it must be remembered that prolonged, deep narcosis may lead to permanent damage to the central nervous system.

From these brief physiological comments, we arrive at further questions to be asked in an alleged injury by solvent vapors.

1. If actually exposed to a solvent vapor, did the worker complain of headache, nausea, vomiting, dizziness, unusual dyspnea, unusual fatigue, pain in the precordium or epigastrium, pain, numbness or tingling in the extremities, pain in the back of the neck, visual disturbances, mental disorientation, muscular incoordination?

2. Did he show any degree of narcosis?

3. Did pulse rate or arterial blood pressure change? If so in what direction?

4. How long after exposure to the incriminated chemical did the symptoms and signs develop?

5. How long did the symptoms and signs remain after removal to uncontaminated air? (In answering this question, do not omit to note whether artificial respiration was used or oxygen inhalation was employed in treatment.)

6. Is there clinical evidence of acute or prolonged disturbance of liver or kidney function?

7. Is there evidence of continued abnormal function of the central nervous system?

As these questions progressively require the answer "yes," or there is a reported persistence of signs or symptoms, the probability of at least temporary disability from exposure to solvent vapor increases, regardless of the nature of the solvent. When most questions and particularly the latter ones are answered by "no" and when the times reported are short—one, two, three, or even eight hours—it appears justifiable to conclude that no significant disability has been produced. Too many "yes" answers or time intervals above eight hours make it necessary to consider medicolegal situations.

Physicians often fail to realize the difference between scientific proof and legal proof. Scientific proof requires careful, honest appraisal of verifiable facts as opposed to mere opinion or "clinical impressions," and selection of that hypothesis which best fits established facts. Legal proof is different. To a referee in a compensation court, to a jury, or to a judge, legal proof is that quantity and quality of factual or opinion evidence, opposed or unopposed, which appears to indicate most reasonably the presence or absence of that degree of disability which the law considers compensable.

Two general theories appear to govern the thinking of compensation courts in the United States. The first makes compensable only the economic loss, that is wage loss, which a claimant has suffered because of an illness arising out of and in the course of his employment. The second disregards economic loss and considers as compensable any departure from normal health that can be attributed to the employment. New York and New Jersey laws at present tend to follow the latter theory.

The theory of departure from normal leads to situations which are very confusing to industrial physicians. Under this theory, it is almost useless for a defendant to enter the court merely to prove that the claimant was not seriously affected by the incriminated chemical. He must be able to explain the pattern of departure from normal, of which the patient complains, on a basis other than that of exposure to the chemical.

When, under the law, the referee is sole judge of the fact, i.e., when an appeal from his decision can be made only because of errors in law, a still more difficult situation can arise. Thus, Dr. A attending claimant B can testify as follows:

"Mr. B is my patient. He tells me that in Mr. Doe's plant he worked with compound Y. He inhaled Y and suffered from the following symptoms. He has so testified in this hearing. I examined Mr. B and found the following signs of abnormality. Now, I know nothing about the manufacturing operations in Mr. Doe's plant. I have never seen compound Y nor heard of it before this case. I know nothing about its toxicology but it is my considered opinion that the signs and symptoms disclosed in examination of my patient, Mr. B, were due to his industrial exposure in Mr. Doe's plant to compound Y. My diagnosis is poisoning by compound Y."

Unless the fact of exposure can be disproved, or outstanding evidence presented to prove another cause of Mr. B's complaints and the results of Dr. A's examinations, B will probably win his case.

For such a situation, physicians often blame the law. Actually, much of the blame rests upon physicians. In diagnostic medicine, we traditionally have placed great emphasis upon the patient's "history." Yet, few physicians are expert cross-examiners. Much that is incorrect may enter the record because of failure to ask the right questions or to ask them in the correct manner. The patient may have a poor memory; he may be relying upon tales told him by his grandmother about childhood diseases; he may, in the light of recent events, be placing undue importance on trivial past events; he may actually be lying. So long as physicians, when unable to reach a sound diagnosis by their own clinical examination, make a so-called diagnosis which rests solely upon the patient's history, just so long will many errors enter the literature of industrial medicine and the records of compensation courts. It so happens that the "history" obtained by the attending physician is one of the few forms of "hearsay evidence" admitted in court. Too many physicians take advantage of this.

I HOPE it is clear now that diagnosis of injury by exposure to solvent vapors involves careful investigation of working conditions as well as recognition of the medicolegal implications of all data collected. To answer the questions posed above, it is not sufficient to make hasty investigations only when legal action threatens. To answer them properly, there must exist at all times adequate knowledge of conditions in the plant using the solvent and adequate knowledge of the state of health of the workers in that plant. Thus, a proper investigation is really a continuous pro-

cedure, starting with the first use of the hazardous solvent and directed at both conditions in the plant as a whole and at trends in the physiological status of all exposed workers. The latter is often the more important for eventual diagnosis should injury be claimed.

Such a proper investigation is really a continuous program of preventive medicine. If conducted scientifically and with sufficient diligence and if trends toward adverse plant conditions or adverse physiological status of workers are promptly checked and their source removed, there will be no need to rely upon any criteria for diagnosis of injury by solvent vapors, except in those true cases of accident due to failure in mechanical equipment or to gross personal carelessness or stupidity. Even in these cases, the background information is necessary for adequate diagnosis.

A further remark appears pertinent. The excessive fatigue produced by continuous or frequent exposure to those low concentrations of hazardous vapors (or for that matter to any chemical) which have little other sign of action can lead to accidents both in the plant and outside it. Recognition of this fact appears to me basic to success of any national campaign to reduce industrial, traffic or home accidents. Further, the medicolegal implications of an out-of-plant accident to a worker affected by an industrial chemical are not always clear. One claim of this type has recently come to my attention. This is a very important field for consideration for there are states in which if an injury is not compensable and the employer is lax in his safety practice he may be faced with a jury trial for damages. In such a case, again, his successful defense will depend to a great extent upon information in his possession and in his physician's possession on conditions in the plant and on the day-to-day health of the employees.

Finally, a new medicolegal situation must be recognized. A suit has recently been entered by a worker in a plant using beryllium, claiming damages for the death of his wife. The complaint states that the worker while doing his job was protected against fumes and dust from beryllium but that he took contaminated clothing home and that his wife, while handling and laundering his clothing in performance of her normal duties as a wife, suffered from a chemical pneumonitis due to beryllium and died from this disease.

It would seem that if workers are allowed to go home wearing contaminated clothing the problems of diagnosis of injury by industrial solvents, or other industrial chemicals, might extend beyond the actual plant worker to members of his family. Here, again, knowledge of the actual conditions in the plant can be of fundamental importance in formulating any defense.

III. RADIATION

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PRIOR to 1942, at which time the Manhattan Engineering District was formed, the industrial uses of radioactive materials were minor and included radium for luminous dials, uranium for ceramic purposes, and thorium for gas mantles. Since 1942, with the development of the atomic bomb project—first under the Manhattan Engineering District and then the Atomic Energy Commission in 1946—the atomic energy industry has had an enormous growth. At the present time, the Atomic Energy Commission has capital assets totaling 12 to 14 billion dollars and has an operating budget of almost two billion dollars per year.[1] The amounts of radioactive materials which are processed daily have also increased enormously. It is estimated that the total production of radium to date has been less than 2000 curies.[2] A moderate size nuclear reactor on the other hand may contain about 100 million curies of radioactive materials.[3]

As we shall see, the fuel elements containing these vast amounts of radioactivity must be processed as a routine matter in chemical plants. In spite of the difficulties of handling such large quantities of radioactive materials, the atomic energy industry has had a lost-time injury rate about one half of the national average.[4] The number of radiation accidents has thus far been negligible, including a few in experimental weapons research and experimental reactor studies and several which occurred during the weapons test program.[4] It may seem paradoxical but the usefulness of diagnostic criteria for radiation damage in the atomic energy industry has been minimal because such accidental exposures as have occurred were obvious at the time of their occurrence and the dosages could be estimated adequately for practical purposes. In addition, the entire Atomic Energy Commission program has enforced such conservative permissible exposure levels that there has been very little problem of questionable radiation injuries. The radium dial industry, in spite of handling comparatively trivial amounts of radioactive materials, has had a much more troublesome health history. Undoubtedly the prior knowledge of the very serious sequelae resulting from the careless handling of radioactive materials, as illustrated by the radium dial industry, was a potent factor in the establishment of rigid control procedures in the atomic energy industry from its very inception. It is probably one of the few ex-

ampues of a major industry exerting strenuous efforts in health protection without the compelling effect of serious accidents occurring during the course of its evolution.

In very general terms, the atomic energy industry at the present time is constituted as follows:

The radioactive raw materials are obtained from mines in this country and also from Canada and Africa. Uranium mills on the Colorado Plateau receive the domestic ore and perform a preliminary refining process which separates the uranium from other minerals. The uranium salts are then shipped to the so-called feed materials plants where the uranium is converted either to the metal or the uranium hexafluoride. The uranium hexafluoride is sent to the gaseous diffusion plants where the U^{238} and U^{235} are separated. These separated gases in various proportions are converted to metal and fabricated into fuel elements for reactors or weapons parts. The fuel elements are sent to the nuclear reactors where under neutron irradiation a fraction of the uranium is converted into plutonium and fission products. After a suitable period of time these highly radioactive fuel elements are removed from the reactor and sent to chemical separations plants where the uranium, plutonium and fission products are separated by chemical procedures utilizing remote handling equipment. The uranium and plutonium are processed again to the metal, and the fission products are disposed of usually by storage.

The types of potential exposures to radioactive materials in the various phases of the atomic energy industry are as follows: In the uranium mines in this country the percentage of uranium in the ore is usually so small as to constitute a negligible radioactive dust hazard; however, radon gas, which is formed from radium present with the uranium, permeates the mine atmosphere and it, in association with its solid decay products, can be inhaled, thereby irradiating the lung. In the ore mills, feed-materials, and gaseous diffusion plants there is the possibility of exposure to various salts of uranium both soluble and insoluble, usually by inhalation as dust, as well as uranium hexafluoride which is handled mainly as a gas. In the nuclear reactor facilities and chemical separations plants there is also the possibility of exposure to fission products which are the fragments which result from the splitting of U^{235} atoms and in themselves are radioactive isotopes of a wide variety of elements. If released in large quantity into the environment, they constitute a potentially hazardous source of radiation.

These radioactive materials yield highly penetrating gamma rays which can deliver an exposure to all portions of the body and poorly penetrating beta rays which are high-speed electrons. The beta rays, originating from radioactive material on or near the skin, can produce a burn without affecting the deeper portions of the body. If these fission products are inhaled or ingested, they will be handled in accordance with the chemical characteristics of the constituent elements and therefore will be absorbed and metabolized in a variety of ways. For example, radioactive iodine, an important fission product, is absorbed almost completely from the intestine and localizes mainly in the thyroid gland, whereas radiostrontium is absorbed to a much lesser extent from the intestine and is lodged almost completely in the skeleton.[5] Uranium, if ingested, will be absorbed to a very minor extent and thus constitute a negligible health hazard by this route of administration. The inhalation and deposition of insoluble uranium salts and fission products may result in long-term irradiation of the lung because of the slowness with which such particles are removed. Inhaled soluble fission products are rapidly carried away from the lung in the bloodstream and distributed to other organs. Highly soluble uranium salts such as uranium hexafluoride when inhaled are removed from the lung and concentrated by the kidney, constituting a chemical rather than a radiological hazard to this organ. It is apparent, therefore, that in order to evaluate properly the potential harm from a radiation exposure one must consider the physical characteristics of the radiation with respect to its penetrability and the chemical characteristics of the radioactive material with respect to absorption and organ localization. In general, an external source of highly penetrating radiation such as gamma rays will tend to irradiate the entire body or major portions of it more or less uniformly whereas radioactive isotopes which are absorbed and distributed to specific tissues or compartments within the body will irradiate specific portions of the body, thus tending to produce different patterns of injury.

Within a decade or two after the discovery of x-rays, most of the varieties of radiation damage were described, including skin burns, cancer, loss of hair, cataracts, sterility, anemia, leukemia, etc.[6] There is ample evidence that, of the various tissues in the body, the cellular elements in the blood are the most readily observed indicators of radiation damage. Of these, the lymphocytes are the most sensitive, and in decreasing order: leukocytes, platelets, and red blood cells. There is evidence that exposures of the whole body to penetrating radiation in single doses as low as 25 r will produce perceptible reductions in the concentrations of circulating lymphocytes. With exposures to either gamma rays or neutrons in the order of several hundred roentgens but in the sublethal range, there is a prompt depletion in the blood lymphocytes which is maximal in 24 to 72 hours. With the initial reduction in lymphocyte count there may or may not be a transient rise in the concentration of leukocytes followed by a reduction to subnormal levels, in a few days to a few weeks. There is a slower reduction in platelet concentration which is maximal in three to four weeks. All the blood constituents return to normal in a matter of months. These blood cell depressions are mild and transient at doses between 25 and 100 r. However, abnormal cellular forms appear such as bilobed lymphocytes, highly

granular and degenerating leukocytes and lymphocytes with refractile neutral red bodies. With repeated small doses of whole body radiation or bone-seeking isotopes a variety of hematological abnormalities have been reported, including leukocytosis, lymphocytosis, leukemoid reactions, erythrocytosis, reticulocytosis, leukopenia, thrombocytopenic purpura and aplastic anemia. Before any diagnosis of radiation injury is accepted, there should be good evidence that there has been exposure to external radiation considerably greater than the currently accepted maximum permissible levels or that there are significant amounts present in the body of such bone-seeking isotopes as radium, strontium or plutonium and that there are no other causes for the observed hematological abnormalities such as benzol or heavy metal poisoning or a variety of viral diseases.[7]

It has long been thought that whole body exposure to penetrating radiation may lead to leukemia. It has been reported that radiologists have an incidence of this disease almost 10 times higher than that of the general population.[8] A study of the survivors of the atomic bombings at Hiroshima and Nagasaki has produced additional evidence of a considerably increased incidence of acute and chronic myelogenous and acute lymphatic leukemia.[9] There is nothing about these cases which makes them clinically distinguishable from those resulting from other causes. Consequently, the assignment of radiation as an etiological agent for any particular case of leukemia must be justified on epidemiological grounds.

Acute radiation burns of the skin do not usually provide a difficult diagnostic problem since they are differentiated from thermal burns by delay in onset of the inflammatory reaction of a few days to a few weeks after exposure and in the chronic state by the frequent occurrence of successive waves of repeated inflammation, ulceration and repair.[10] The dosages required to produce such lesions are relatively large and would usually occur under obvious circumstances. Sequelae to severe radiation burns are typical and consist of thin atrophic skin with telangiectasia and not uncommonly, keratoses and skin cancers. The nails can become brittle and streaked. The histopathology of the skin may be of considerable diagnostic importance and is characterized in the chronic stage by an atrophic epidermis, atrophy of sweat and sebaceous glands, a hyalinized dermis and vascular telangiectasia.[11]

As indicated previously, ionizing radiation to the eye in sufficient amounts can produce cataracts. In the early stages these lesions are rather characteristic (although not diagnostic) and consist of granules and vacuoles lying under the posterior lens capsule, bulging anteriorly but sharply demarcated from the cortex.[12] The opacities arrange themselves to form a bivalve configuration. There is a very slow progression in severity of these lesions which may or may not eventuate in some interference with vision. Late changes include opacities within the cortex of the lens and at this stage the lesions are indistinguishable from other types of cataracts. In a study of persons exposed to atomic bomb radiations in Nagasaki, 84% had granular opacities compared to 10% in non-exposed controls.[13] However, none of the exposed cases had measurable interference with vision. The early lesions are seen in only a few other conditions, including retinitis pigmentosa and cataracts associated with non-ocular diseases such as rheumatoid arthritis. Elderly persons may also have such lens changes but these are associated with other changes which do not result from radiation injury.

There is a possibility, in a number of operations in the atomic energy industry, for exposure to radioactive dust which can result in irradiation of the lung. We have no indications of any ill effects from such exposure in this country but there was a high incidence of bronchogenic carcinoma in the European uranium mines.[14] Unfortunately, information from those mines on the levels of air-borne radioactivity is fragmentary and we are also aware that there were exposures to other possibly carcinogenic dusts. The pathological evidence indicates that the types of lung cancer which developed in about 40% of the European uranium miners were indistinguishable from those which occur spontaneously in any population.[15] In atomic energy plants the levels of exposure have been maintained far below the estimated concentrations of radioactivity in the European uranium mines but because of the 15-year latent period for lung cancer, we have no certain data on the safety of our current permissible exposure standards. Since there are no distinguishing features to uranium miners' lung cancer, we face the same diagnostic dilemma as was mentioned with regard to leukemia.

Similarly, the osteogenic sarcomas which occurred in the radium dial workers as a result of the deposition of radium in the skeleton are also indistinguishable pathologically from those which occur from other causes.[16] There is ample experimental evidence in animals that bone-seeking isotopes such as strontium and plutonium are capable of producing bone cancers similar to the human radium sarcomas.[17] We have some measure of the amount of radiation which has resulted in bone cancer in humans and our permissible levels are established with a large margin of safety. An interesting study has recently indicated that patients given radium salts many years ago for a variety of diseases have sustained some fairly characteristic bone changes which range from small areas of decreased density in the skull and long bones resembling lesions of multiple myeloma to fairly extensive areas of bone rarefactions resembling infarcts as seen in caisson disease.[18] More advanced changes include areas of aseptic necrosis and the aforementioned sarcomata. These changes again are not diagnostic but are suggestive of radiation damage from radioactive salts deposited in the bone.

In summary, it is apparent that most of the kinds of radiation damage are non-specific and that any differential diagnosis involving radia-

tion damage rests heavily on the availability of accurate estimates of the magnitude and type of radiation exposure. It is of great importance therefore in the operation of any process utilizing ionizing radiation to establish rigid exposure controls with careful documentation of the duration and type of personnel exposure in order to facilitate the diagnosis of disease or injury which might subsequently arise. It would appear, however, from experience in the atomic energy industry to date, that when such controls are properly established there should be little need of differential diagnostic criteria for radiation injury.

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IV. ORGANIC MATERIALS

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PREPARING a discussion of criteria for diagnosis of occupational diseases due to organic materials is not easy. There are estimated to be approximately half a million such chemicals in existence today, as compared with about 259,000 in 1938, and only 18,000 in 1883. Obviously, only a small fraction of these have been adequately studied for toxicity.

Fortunately, the human body contains a limited number of organs and systems that can be affected, so that we need not consider the possibility of half a million different kinds of occupational disease. We can also subdivide organic chemicals into classes like aromatic amines, carbohydrates, organo-mercurials, and so forth. And we will find certain similarities of physiological effects within these classes. Aromatic amines as a class, for example, have a habit of reacting with hemoglobin in the body in such a manner that oxygen can no longer be transported efficiently by the blood. As a result, arterial blood tends to resemble venous blood in oxygen saturation and in color, and the victim assumes a typical cyanotic appearance. The naphthylamines, however, are aromatic amines but cyanosis is seldom seen in workers making or handling them. Alpha-naphthylamine in fact is a rather non-hazardous chemical. Beta-naphthylamine, on the other hand, is one of a very few pure organic chemical compounds which has been definitely proved capable of causing papilloma of the bladder in men or certain animals exposed to it over a sufficiently long period of time. It is the exceptions to the rule which continually cause trouble.

Let us then forget about class generalizations for the time being and consider the most general problem, an organic chemical which we will simply designate "X." Let us assume that X is a new composition of matter, the product of synthetic organic research, and that screening tests have shown that it is a promising antioxidant. Management has decided to make several hundred pounds of X in a pilot plant and half a dozen workmen will be involved in the operation for a period of six months. If detailed evaluation so indicates, the pilot operation will be extended to full-scale plant production. Aside from the information that X is a good antioxidant, the plant physician has no knowledge of its physiological effects. Yet he is expected to assume responsibility for the health of the workmen making X, and to detect any possible adverse physiological effects before they become serious.

If given only the information listed above, the only safe course would be to assume that X is indeed a very hazardous material and to advise handling it as such. With exposure to X at an absolute minimum, and with careful and repeated clinical examination of the workers in an effort to detect *any* kind of deviations from the normal,

an effective preventive medical program can be carried out. When working at the laboratory or even the semi-works stage, this kind of program might even be the most economical, but at full-scale production stage it would obviously be uneconomical to treat X as though it were as toxic as botulinus toxin, if, in fact, X were as harmless as glucose.

Long ago Hippocrates observed, "There are indeed two things, knowledge and opinion, of which the one maketh the possessor to be wise, the other to be ignorant." An intelligent and economical program of diagnosis of possible deleterious effects of X requires knowledge of the toxic potential of X, how much could be reasonably tolerated, how likely it would be to exceed the safe tolerable amount under given conditions of manufacture or handling, and what kind of adverse effects might be expected if overexposure occurs. No amount of opinion can substitute for such knowledge. In time human experience with X could supply the necessary information, but only at the cost of probable human injury.

The recognition of the fact that human injury should be anticipated rather than experienced, has led to the science of industrial toxicology. Long before X reaches the full-scale production stage, its effects on various experimental animals should be investigated.

A simple determination of the acute lethal dose of X for the white laboratory rat immediately gives some indication of the toxicity of X for this species and permits comparison with the toxicities of other compounds which have been tested on the same species. If X is not a gas at room temperature, the common procedure is to administer graded doses of X by stomach tube until some measure of the minimum lethal dose is obtained. This may be the relatively crude Approximate Lethal Dose, the more refined and expensive LD_{50} or still more refined and expensive LD_0 or LD_1, the subscripts representing the percentage of animals succumbing to the dose. Acute lethal dose is usually expressed as milligrams of test material per kilogram of body weight. On the basis of the acute lethal dose X can be classified according to some such scheme as that of Hodge, *et al.* (Table I) as "highly toxic", "moderately toxic", or "practically non-toxic." Still it is not justifiable to assume that the lethal dose for the rat in terms of mg/kg is also the lethal dose for man in terms of mg/kg. The acute lethal dose should be determined for other species such as the guinea pig, and if practical for some non-rodent species. If the acute lethal dose in mg/kg is approximately the same for all species tested, one may be justified in assuming that there is little species difference in susceptibility to X and that man may be equally susceptible. If there is a species difference, then it must be assumed *pro tem* that man is at least as susceptible as the most susceptible species tested. These studies of acute toxicity may also demonstrate a sex difference in susceptibility if such should occur.

It is our opinion that all animals used in an acute lethal dose study should be subjected to gross and microscopic pathological examination whether they succumb to the test dose or not. Survivors should be sacrificed and autopsied after they have survived a sufficiently long time to insure that they will not die spontaneously. Our own criterion of survival is that the animal be alive and growing at a normal rate 10 days after dosing. These pathological studies tell what organs are damaged by X and whether demonstrable organic injury occurs at sublethal doses. It is obviously important for the physician to know whether X attacks the kidneys or produces pulmonary edema, for example, if he is expected to diagnose poisoning by X in workers. Sometimes, pathological examination fails to reveal any organ damage in animals which succumb to the chemical. Even this finding is valuable because it leads immediately to the suspicion that death from X is due to a biochemical or functional rather than organic lesion.

TABLE I.
TOXICITY CLASSES

Extremely Toxic	Highly Toxic	Moderately Toxic	Slightly Toxic	Practically Non-Toxic	Relatively Harmless
100 MICROGRAMS/KG	1 MG/KG	10 MG/KG	100 MG/KG	1 G/KG	10 G/KG	100 G/KG
LOGARITHM DOSE					

The acute toxicity of X can be studied by routes of administration other than the oral. What happens, for example, when X is applied to intact skin? Can it produce systemic effects or even kill? And if so, what is the probability of injury for workers who might have skin contact with X? These questions can be answered after a fashion by applying graded doses of X to the shaved skin of experimental animals, observing the clinical response and following up with detailed pathological examination of all animals tested. The rabbit is the most commonly used animal for the skin absorption toxicity test but other species are also useful.

Another probable route of human exposure to X may be its inhalation as vapor, mist, or dust. Here the industrial toxicologist will attempt to define the lethal dose of X in terms of concentration and exposure time, as is illustrated in Table II. Pathological studies will serve to tell the physician whether the effects of X by inhalation differ from those produced when X is given by mouth or by application to the skin.

With the above information, one would have a pretty good basis for diagnosing acute effects of exposure to X, and for devising a treatment for acute injuries from X. This information should also be adequate for designing the production facilities in such manner as to avoid gross overexposure to X.

Yet in industry it is not the gross overexposures which create the most difficult diagnostic problems, but the chronic exposures to definitely sublethal amounts day after day, perhaps year

TABLE II.
ACUTE INHALATION TOXICITY OF "FREON-113"

Exposure ppm	Hours	Symptoms	Pathology
19,500	6	Mild excitement at beginning of exposure.	None (11 days after exposure).
33,300	6	Moderate excitement at beginning. Marked excitement in 3-4 hours. Dyspnea in 3 hours.	Lungs: Slightly emphysematous and atelectatic 10 days after exposure.
71,300	6	Marked excitement in 5 minutes. Incoordination in 20 minutes.	None (10 days after exposure).
78,700	4	Incoordination in 15 minutes. Convulsive in 30-40 minutes. Prostrate but conscious in 2.5 hours. Recovered 20 minutes after end of exposure.	None (11 days after exposure).
86,900*	4	Convulsive in 10 minutes. Unconscious in 20 minutes. Dyspnea and cyanosis in 40 minutes to 4 hours. One rat died in 90 minutes.	Rat that died: Pulmonary edema. Surviving rat (11 days): None.
141,500*	1-1.66	Unconscious in 10 minutes. One rat died in 1 hour, the other in 1.66 hours.	Lungs: Congested and edematous. Thymus: Congested.

*By analysis.

after year. Given that X has a certain lethal dose and that it produces certain acute effects, how much exposure can be tolerated eight hours a day for an indefinite period of time without *any* injury to health? How do we know for example that long exposure to X might not result in cancer, or pulmonary fibrosis, or cirrhosis of the liver, or what have you? To provide some basis for evaluating the chronic toxicity of X, the industrial toxicologist administers the material for long periods of time to test animals, either as a part of the diet or by inhalation. One such test involves administration of X to a test species over practically its entire life span, as for example, the two-year test with the rat. An approximation is then made of the maximum safe dose level, and considerable information is obtained as to what is likely to happen when the safe level is exceeded.

Two-year tests with rats are, of course, very expensive, and while they may be necessary in some instances it is often possible to arrive at diagnostic criteria of chronic toxicity in a shorter time and at less expense.

I believe that most industrial toxicologists share the opinion that specific organ damage is preceded by physiological and biochemical changes which may be either specific effects of the particular compound or else non-specific reactions to stress. If we are fortunate enough to detect these changes, they afford an early indication of impending organ damage and give the physician a chance to take remedial steps which can prevent injury from ever occurring.

Let us suppose that X was incorporated into the diet of weanling rats at levels of 0.005%, 0.05%, and 0.5% respectively for a period of 90 days. All animals survive, but those on the highest level of X fail to grow as well as those on the lower levels in the control diet. All animals are sacrificed for pathological examination, which yields the following results:

1. The addition of 0.5% X to the diet of rats for 90 days resulted in liver damage as manifested by large livers with focal necrosis and an increase in fat content.

2. The addition of 0.05% X to the diet of rats for 90 days resulted in a highly significant increase in the liver size of male rats compared to the controls, and a variable (minimal to extensive) increase in the amount of fat in the liver of animals of both sexes.

3. The addition of 0.005% X to the diet of rats for 90 days resulted in no detectable pathology.

From these results it appears likely that chronic overexposure to X will result in liver damage, and this is one of the most difficult types of injury to detect by direct clinical tests until the organic lesion is well established. Indeed, in the example selected only the rats receiving the 0.5% of X in the diet showed an impaired liver function test, yet minimal anatomical changes were demonstrable at the 0.05% level.

The physician responsible for the health of workers exposed to X would, of course, pay particular attention to any symptoms and signs of hepatic involvement, and would no doubt make use of simple liver function tests to confirm clinical impressions of liver damage. Ideally, however, he will try to detect overexposure to X before these tests become positive.

On the experimental side, X might be administered to larger test animals, such as the dog, on which more detailed physiological and biochemical studies are possible than with the rat. We have found, for example, that statistically significant changes in blood pressure of dogs frequently occur at exposure levels which produce no detectable organ pathology. Such changes are entirely non-specific and merely indicate stress, but when present in dogs they do provide the physician with a "good bet" for examination of workers. Another non-specific indicator of the effects of X might be the occurrence of certain abnormal types of white blood cells. I merely emphasize that with patience and good luck some physiological or biochemical variable might be found which responds to the administration of X before organ damage occurs. The physician should certainly take full advantage of such indicators even though they are not specific for the type of anatomical injury which would eventually occur.

Let us suppose, for example, that dogs show a statistically significant elevation of diastolic pressure at the earliest indication of chronic effects of X. It is at least worth-while then to look for blood pressure changes in workers exposed to X. If such changes should occur in any particular worker exposed to X, the physician would need additional information before the effect could be ascribed to X. He would need to consider the extent of this worker's exposure to X and decide whether it could possibly be sufficient to account for the signs and symptoms. You are familiar with industrial cases in which some fleeting exposure to a chemical is held responsible for vague symptoms occurring weeks or months later. I recall investigating a case in which there had

been a single rather mild exposure to chlorine gas after which the alleged victim claimed that as a result of the exposure he always woke up with a headache on Sunday mornings.

The physician must, therefore, establish both a causal and a time relation between exposure and effect. In the case of minimal physiological changes due to stress, it is particularly important to evaluate the duration and extent of the worker's exposure against the results of subacute or chronic animal exposures. It is also helpful to consider the worker's exposure to X in relation to that of his fellow workers since chronic exposures can seldom be confined to a single individual. Another helpful confirmation might be the detection of X or some metabolite of X in the worker's blood or urine. He would need to consider and rule out extraneous causes of disease before accepting the blood pressure change as probably due to X. If a number of workers who are exposed to X show the same change, the suspicion will be at least strengthened that X is at fault.

Finally, and this may be very important indeed, the physician must bear in mind that there are today a host of organic chemicals which are used as medicaments. One need only mention the sulfa drugs, the antibiotics, and the large number of remedies for the common cold which include the antihistaminics and antipyretics. All of these are organic chemicals and all have potential "side effects" which are in essence toxic reactions to the chemical in question.

When a worker, therefore, presents signs and symptoms which may be due to industrial organic chemicals, it is at least expedient to inquire whether the patient has been taking medication, either on a physician's advice or on his own initiative. Suffice to say, that there are many proved cases where a medicament has produced toxic manifestations which might have been attributed in error to an industrial organic chemical.

IN SUMMARY, there appear to be no quick and easy criteria for the diagnosis of occupational disease due to organic materials. When the disease is full-blown the diagnosis may be simple but from the point of view of preventive medicine, such a diagnosis is a confession of failure. Even though there are thousands of organic materials, however, we believe that it is possible to develop criteria of diagnosis that are consistent with a program of industrial preventive medicine. First, the physician should get a thorough evaluation of the effects of his organic material on experimental animals. Even though he cannot depend too much on translating animal dosages to human effective dosages, he will at least know what organs or systems will be affected, and from such knowledge may be able to formulate a satisfactory program for medical control of the workers. Even where no specific diagnostic test or tests appear to be satisfactory for such medical control, there is still the possibility of using non-specific criteria of stress as indicators of excessive exposure. Indeed, these latter may turn out to be the most sensitive and satisfactory of them all when applied with intelligence and understanding of their uses and limitations.

A Major Problem

IT CANNOT be said that the executive in modern industry is free of the frustrations that contribute to emotional instability in the labor force. He is subject not only to the strains of his demanding job, but also to the hazards of modern competitive society and to the hazards which he brings into his office with him. These latter are probably the most serious of all. They have to do with personality maladjustments, mood disorders, and unconscious motivations patterned in childhood. Like the worker everywhere, the executive brings to the job all his hopes, his fears, his worries, his disappointments, his family troubles—all operating against the background of a changing social panorama. When the executive is emotionally disturbed, there is always a major problem in the organization. This is true not only of the top men, but of people along the entire supervisory echelon who are in charge of other people. It is axiomatic that one badly maladjusted supervisor can cause more trouble in a plant than an epidemic of measles. Strangely enough, this individual rarely recognizes his problem himself and is very much surprised when told about it. Preventive psychiatry in industry must start at the top if it is to be effective.

—FRANCIS J. BRACELAND, M.D., in *Med. Annals District of Columbia*, quoted in *Med. J. U.S. Armed Forces*, August, 1955.

Surgical Treatment of Diverticulitis of the Colon

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TRADITIONALLY, diverticulitis has been treated largely by the internist. The usual situation may be fairly clear-cut and a syndrome which has been likened to a "left-sided appendicitis" may be rather obvious. Occasionally, however, the diagnosis is very obscure so that the surgeon may find himself exploring an abdomen under an entirely erroneous impression. Frequently the patient will have suffered bouts of inflammatory disease so that the gamut of medical measures such as strict rest in bed, hot packs to the abdomen, continuous suction by nasal tube followed cautiously by administration of a liquid diet and finally by a minimal-residue diet, use of opiates as indicated, administration of antibiotics and sulfonamides, and similar routines may have become quite familiar to him.

Strangely enough, in spite of tremendous advances in the surgical world, even today some surgeons advocate this so-called conservative plan which may or may not be based on correct surgical thinking.

In the past the surgeon almost always insisted upon a multiple-stage operation, and the reason for this was obvious. He learned by bitter experience that the risk of any other type of operation was prohibitive. We have wondered recently whether a summary of all recent advances might not lead to the conclusion that once the inflammatory process has quieted down the surgeon might have a good deal to offer some of these patients in the form of one-stage resection carried out at the proper interval.

Background Information

PEMBERTON and co-workers[1] earlier summarized the data on a significant series of patients studied at the Mayo Clinic. The reasons for surgical intervention were made quite clear and the method of treating these patients was outlined. It was found that in many patients proximal colostomy was mandatory and such a stoma usually was established during the inflammatory interval. Many patients respond so dramatically after a few months with a colonic stoma that x-ray examination of the distal loop of the colon may reveal nothing except scattered diverticula with no evidence of inflammatory change. In such instances the temptation may be great to close the stoma. Indeed, in a third of such cases in the series mentioned, this seemed to work out fairly satisfactorily; however, these authors stressed that in two-thirds of the cases the diverticulitis recurred. Faced with a failure of such magnitude, Pemberton and co-workers concluded quite logically that all patients must undergo resection of the diseased colon before the colonic stoma can be closed. Pemberton has stressed repeatedly that resection of the left portion of the colon for malignant disease often is far simpler to carry out than is the same operation for diverticulitis.[2] Much of the change in the latter disease is located in the mesosigmoid and surrounding structures. The indiscriminate attempt at intraperitoneal anastomosis in some of these cases has led to very unsatisfactory results. Thus, Pemberton occasionally established a second colonic stoma at the point of resection of the diseased segment, even though a proximal stoma had been present for as long as six months. He thought it was far safer to clamp the two spurs simultaneously and finally to close the two stomas extraperitoneally than to do otherwise.

In an earlier report on this subject I stressed that the complications of diverticulitis are usually quite evident and may be of a striking degree.[3] These will be outlined in more detail below. More recently, Mears and I reported on the possibility of an orderly so-called prophylactic resection carried out as an elective operation for those patients suffering repeated attacks of acute diverticulitis.[4] Such patients are selected carefully so that they may be operated on during a quiescent interval, and the success in a significant group has been so striking as to stimulate further study of this approach.

Some of the important conclusions from that study will be mentioned later.

It would appear difficult to predict at what part of the colon the diverticulitis might develop. Since diverticula are visible on the x-ray film not only throughout the entire left portion of the colon but occasionally in the transverse colon or even on the right side of the colon, it would seem that among

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many cases one might occasionally be faced with the necessity for almost total colectomy. However, it is common knowledge that for some unexplained reason true diverticulitis almost always strikes a limited portion of the sigmoid; my colleagues and I have conjectured that the small caliber of the bowel combined with the solid character of the stool and the greater motility during peristaltic activity might explain this. In 98% of the proved cases of diverticulitis in Mayo's series, only the sigmoid was affected.[5] In a previous report diverticulitis of the right portion of the colon was discussed and it was pointed out how extremely rare it is for such a lesion to occur in the hepatic flexure.[6]

Complications of Diverticulitis

OUTSTANDING among the complications is the presence of an abdominal mass. At times this mass may be detectable on rectal examination. Frequently, bimanual examination will reveal the mass, and it is important that the gynecologic surgeon bear constantly in mind the possibility of diverticulitis in the diagnosis of left adnexal disease. The question of whether the mass is benign or malignant must be answered, and regardless of the amount of experience on the part of the surgeon, the internist or the roentgenologist, there will be times when the issue cannot be settled until the pathologist has a specimen under the microscope.

Another complication of diverticulitis, and one which is frequently of almost emergency proportions, is that of obstruction. A clear-cut history of diverticulitis often serves to make diagnosis and treatment easier during such an emergency situation. At times, conservative measures allow the obstruction to subside sufficiently to permit decompression of the colon so that more orderly surgical measures may be carried out. However, if the obstruction does not subside in a short time my colleagues and I follow the policy of carrying out immediate transverse colostomy in the belief that resection in such cases is fraught with great danger; resection is to be done at a later date. We have found that the average patient requires a third operation, namely closure of the colonic stoma, which is an entirely independent step. Thus, we must impress upon the patient who is faced with this type of treatment that he may be away from his job for a year or more unless the job is such that he can do it while he has a double-barreled colonic stoma.

The timing of the stages of the operation perhaps is of less importance than we formerly thought. We earlier insisted that having established the colonic stoma to relieve obstruction produced by the highly inflammatory segment of sigmoid we must then wait for at least six months before attempting the resection. Even at the end of that time, small abscesses might still be present in the general area affected. Following resection, whether completed by end-to-end anastomosis or by a second colostomy (the so-called extraperitoneal or obstructive resection), we would wait a variable period of months before daring to close the colonic stoma. We now reduce the intervals between stages as much as we possibly can. The risk can be quite reasonable, and such benign lesions should be subjected to the lowest possible surgical risk.

The possibility that significant hemorrhage may occur is stressed more and more in the discussions of diverticulitis in the modern surgical literature. My colleagues and I were not particularly impressed by this until recently, but now we agree with many others that bleeding may be quite brisk. Mayo[5] found that in a series of 202 patients with proved diverticulitis, 8% had enough bleeding from the colon to make it a major factor in the disease. More often a patient is seen with intestinal bleeding of unknown source and after complete diagnostic survey the only possibility that remains is diverticulosis with possible inflammatory change. Be that as it may, numerous authorities have now reported that in certain instances there has been no further bleeding following resection of the colon for diverticulitis, and one is forced to the conclusion that the diverticula may have been the source of bleeding. We have noticed that some specimens reveal polyps when examined closely and we do not believe that diverticulitis should be incriminated as the source of the bleeding in these cases, as the polyps are much more likely to be the chief offender.

Fistula formation is one of the most difficult of the possible complications. In mismanaged cases, fistula is common. Occasionally a patient will be seen who has undergone appendectomy for suspected acute appendicitis. The presence of diverticulitis may or may not have been discovered at that time. In some of these patients a drain may have been placed down to the inflamed sigmoid colon and soon after operation the fistula has become evident. Often the fistulous process may go on to involve other loops of intestine or even the urinary bladder. Fortunately in the female the uterus and adnexa help to protect the urinary bladder, but occasionally such a fistula may develop even in the female. It is in the neglected patient that this problem arises, and it seems that if proximal colostomy is performed whenever indicated, the incidence of fistula formation can be reduced very sharply. The patient who has repeated attacks of diverticulitis treated only by non-surgical methods is the one most likely to have such a fistula. Occasionally patients state that they have expelled gas by way of the urethra, and in such cases it does not seem that prolonged urologic survey is indicated, because resection of the intestine is mandatory before the fistula becomes a major one.

Free perforation with general peritonitis is possible, but extreme cellulitis with abscess formation is seen more frequently.

Surgical Features of Diverticulitis

THE ACUTE form of the disease has been mentioned briefly above. There are so many possible ramifications that it is difficult to describe any typical syndrome but in the type of practice

in which my colleagues and I are engaged certain features are predominant. Usually the history is suggestive. For some peculiar reason the great majority of the patients are extremely obese. If an elective resection is decided upon, the most important single preoperative adjunct is the reduction of a significant amount of this excess fat. Not only is the risk decreased considerably thereby but also the possibility of more accurate surgical technique is greatly enhanced.

Occasionally one sees a patient who has been subjected to exploration under emergency conditions for possible appendicitis. After removal of a normal appendix a general abdominal examination has disclosed a highly inflammatory sigmoid mass. If this loop of bowel had already perforated, vain attempts may have been made to suture the perforation but such attempts without proximal colostomy should be condemned. If there is a single leaking point that can be covered over, there should be no objection to doing this, but ordinarily there is a large abscess throughout the left lower quadrant and all that one can accomplish or should attempt to accomplish is drainage of the abscess accompanied in every single instance by the establishment of a double-barreled stoma in the transverse colon. Perhaps cecostomy would serve the purpose of decompressing the colon, which is distended with gas, but it is not at all effective for diverting the fecal stream. In fact, some surgeons insist upon complete division of the transverse colon with wide separation of the loops to be certain that the fecal stream is absolutely diverted. If there is one single argument to be made, it is for mandatory establishment of the colonic stoma.

Then, too, one often sees a patient who has undergone colostomy as an emergency measure and for whom this has proved to be a lifesaving step. However, the unpracticed surgeon may have established such a stoma in the upper part of the sigmoid or in the descending colon, feeling that it would be far more pleasant for the patient to have a formed stool rather than the liquid type of stool which might be seen after transverse colostomy. Thus, since it is agreed that the left part of the colon must be resected, the presence of a stoma in that general area makes later resection not only tediously difficult but sometimes almost impossible.

Another situation is one in which the patient has only moderate obstruction and shows signs of moderate inflammatory disease. My colleagues and I often make a left-sided incision in such a case, exploring the mass directly. This gives us much more of an idea concerning the possible malignancy of the mass although we are the first to admit that mere palpation of the mass at times is most misleading. Also, we can decide whether the mass is removable at the moment. If it is not, it is a relatively simple matter to close the left-sided incision and do a transverse colostomy through a short upper transverse incision. The injudicious dissection of such an unknown mass, which might eventuate in sacrifice of the left ureter and injury to the iliac vessels and to other vital structures, is to be condemned. Our policy is always a conservative one in such cases, and wherever there is any question we do the colostomy and resect the colon at a later date.

There is a certain field of usefulness for the old-fashioned Mikulicz operation (or a modification in the form of Rankin's "obstructive resection") if dissection reveals that the mass can be mobilized without injury, but the unprepared, partially obstructed bowel and highly inflammatory tissues make intraperitoneal anastomosis foolhardy. Even today one occasionally resorts to some of these time-honored procedures.

The unsuccessfuly treated patient who has ended up with multiple fistulas will tax the patience and ingenuity of even the most experienced surgeon. Time is kind in most of these cases, and after the establishment of a diverting colonic stoma, persistence with warm irrigations of the distal loop and the allowing of enough time to elapse usually render the situation one which will respond to careful resection at the proper interval with repair of other organs as indicated.

As mentioned above, my colleagues and I have taken a rather arbitrary stand in regard to timing of the stages. If a mass is so inflammatory that we do not dare do a resection by any known method and we elect to do a colostomy first, we insist that the patient wait six months for ultimate resection. We have varied this interval from time to time and have done the resection in some cases as soon as one month after colostomy. In those cases in which reasonable doubt exists about the possibility of malignancy, we have waited four weeks after colostomy and then, after cautious irrigation of the distal loop to get rid of accumulated material, have carried out a second x-ray survey. Frequently in these cases the roentgenologist can decide quite accurately whether the lesion is entirely one of diverticulitis or whether malignancy may be present. In most instances we can then wait an additional five months but occasionally we proceed at once with resection if the roentgenologist is in any doubt. We have been agreeably surprised in the occasional case to observe the marked improvement in the inflammatory changes that has come about in a few short weeks. At the time of resection there may be considerable narrowing of the bowel, and, although in the majority of instances we can carry out end-to-end anastomosis, frequently, we find ourselves concerned about the size of the lumen. Patients who have had the colonic stoma for one or two years may have so much constriction that it is better to employ the Rankin obstructive type of resection, closing both stomas later.

It is after resection that one may be lulled into a false sense of security. The patient may be eager to have the colonic stoma closed, but to accede to his demands too early may cause regret. The so-called recurrence of diverticulitis or, more specifically, of sigmoidovesical fistula, often is likely to represent a breakdown of the recent anastomosis produced by too early a closure of the proximal stoma. My colleagues and I have rarely

experienced true recurrence of diverticulitis after resection. We prefer to dismiss the patient and allow him to return to his home for at least a month, and then have him return for cautious irrigation of the site of anastomosis both by way of the stoma and by way of the rectum (and x-ray examination of this site with the aid of barium if necessary) to prove that the anastomosis is intact. Whenever any question exists we defer closure of the stoma for several more months. In the average patient, one month will suffice, but sometimes it takes a year or 18 months from the time diverticulitis develops until he is finally rid of his colonic stoma. The economic, sociologic and psychic aspects of such serious disease are obvious.

Morbidity and Mortality

FOR obvious reasons the extent of the morbidity from diverticulitis is most difficult to determine. With such extreme inflammation present and with the multitude of fistulas that occasionally is observed, it is a wonder how some of these people can survive. However, with diligence and patience the morbidity today can be kept at a minimum. The advent of the antibiotics has introduced an important weapon, and judicious use of these agents may reduce the morbidity rather sharply. When time permits preoperative preparation, my colleagues and I use at least a two-day period to cleanse the bowel mechanically with laxatives and enemas and also to attempt to sterilize its contents by the use of antibiotics given in large doses by the oral route. At present we favor Neomycin as it has been very effective, is new enough so that the bacteria are yet to become generally resistant to it, and is surprisingly free of toxic reactions. The complications are those one would expect when a major operation is performed on a badly diseased intestine, especially in older, frequently very obese, people. The complications today are largely those of the wound in such persons. Other complications seen less often are those common to any major abdominal operation.

The hospital mortality rate has declined steadily in recent years. This reflects not only experience in the selection of patients and in the selection of operations, but also general acceptance of all the effective adjuncts that have been made available for preoperative, operative and postoperative care.

Comment

IN THE past, surgical treatment of diverticulitis has been limited largely to patients exhibiting one or occasionally a multitude of complications of the disease. The internist has led the way in conservatism so that even many surgeons have adopted this attitude. Much of this thinking has been based on the multiple-stage operations which formerly were all that the surgeon had to offer. With present-day advances in anesthesia and in preoperative and postoperative care and with stress on antibiotic therapy and blood transfusion, the surgeon is now in a position to offer a one-stage prophylactic resection to those who have repeated acute attacks of diverticulitis. This point is stressed in the hope that an awareness of it will make it possible for the surgeon to see more of these patients during a symptom-free interval so that time will permit complete preoperative preparation for what actually can be a very easy one-stage resection without any colonic stoma.

Recently, my colleagues and I have completed a study of 68 patients who were carried through one-stage resection of the type just mentioned. These patients did not have simple, uncomplicated disease by any means, but each had at least one, and some had all, of the complications mentioned above except that one patient had merely intractable diverticulitis as the indication for operation. We were pleased to see that even diverticulitis with fistula formation could be handled in this manner although we would prefer to be called to see the patient before a fistula is allowed to develop. The average length of stay in the hospital for these people obviously could not compare in length with the hospitalization required where multiple-stage operations were performed. The tremendous saving in time away from the job for the head of the family, the saving in expense of hospitalization and medical care, and the reduction of emotional upset and psychic trauma are all very obvious. There was but one death in this series and that was of a patient who, while preparing to leave the hospital after resection, suddenly experienced an exsanguinating hemorrhage from a previously unsuspected duodenal ulcer.

We believe that at present the surgeon is in a position to offer an elective, orderly, well-planned attack upon a disease which if neglected or too long treated conservatively may not only produce extreme distress and prolonged complications but actually take the patient's life.

Summary

DIVERTICULITIS is a relatively common and at times perhaps a neglected disease. The internist has cared for the majority of these patients in the past but it is suggested that the surgeon should take a more positive attitude. Multiple-stage resection for severe complications of diverticulitis must remain as the method of choice whenever indicated. The disadvantages of multiple-stage operation are outlined. Prophylactic single-stage resection during the quiescent interval has much to offer those patients suffering repeated acute attacks of diverticulitis.

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A Skin Cream for the Prevention and Treatment of Ivy Dermatitis

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THE EFFECT of ivy poisoning on industry, including time spent in dispensary visits and actual work loss, is appreciable. Obviously, this problem is more troublesome to industries involving a great deal of work in the outdoors. For this reason, various measures, including inoculations, have been tried in the treatment of poison ivy dermatitis among employees in the Plant Department of the New Jersey Bell Telephone Company where there is frequent exposure to the poison ivy plant. The over-all results, however, in the past have been less than satisfactory.

Since there has been no generally accepted method either for the prevention or treatment of this annoying and sometimes painful dermatologic condition, any remedy showing promise seemed well worth a clinical trial. Recently, a new preparation, Pyribenzamine® Cream with Zirconium, was suggested for the prevention and treatment of ivy poisoning. A review of the laboratory and clinical reports on this preparation and its active constituents, was most encouraging. Carrier and others[1] found topically applied tripelennamine hydrochloride "a very valuable adjunct in the treatment of dermatitis due to plants, especially poison ivy." The author of another study using topical tripelennamine hydrochloride in contact with other types of allergic dermatoses reported it was of "Definite help both in the relief of itching and in healing of dermatoses which are usually difficult to treat."[2]

Later studies of zirconium, a metallic element, demonstrated its effectiveness in neutralizing urushiol, the toxic principle in Rhus dermatitis.[3,4] Zirconium precipitates and then inactivates the urushiol.[5,9] There is also evidence that even after the dermatitis develops, application of the zirconium facilitates healing by removing or inactivating excess toxic material.[3]

Cronk[3] found a combination of zirconium with tripelennamine cream to be an excellent preventive against Rhus dermatitis—"a hydrous zirconium oxide with tripelennamine hydrochloride will prevent the development of Rhus toxicodendron dermatitis when applied to urushiol-treated sensitive skin one hour after poison-ivy extract application." Downing[10] more recently noted this same effect.

Pyribenzamine® hydrochloride (tripelennamine hydrochloride CIBA).

Results of a controlled study[1] with this new combination on 906 soldiers on field duty in a poison oak infested area of California offered good evidence of its prophylactic value. Only 9.6% of the soldiers using the preparation developed Rhus dermatitis, in contrast to an incidence of 21.9% and 20.6% respectively in the placebo-treated and non-treated subjects. Included within the 9.6% were soldiers with Rhus dermatitis which developed first on genitalia or legs where no medication had been applied.

Barrett[12] in another clinical study claimed that tripelennamine cream with zirconium is "effective in relieving the pruritus of Rhus dermatitis in 24 hours and is also effective on lesions existing from a few hours to several days."

The favorable results obtained with this combination in ivy poisoning were of sufficient interest, both from a medical and industrial point of view, to warrant undertaking an evaluation of the product. The prime objective was to determine whether this new preparation was more effective than those already in use.

Method of Procedure

PREPARATORY to the actual start of the evaluation, health records were checked and prospective participants were divided into two main groups. The first main group was composed of 255 employees who were known susceptibles—either those known to have had poison ivy dermatitis or those who had requested preventive inoculations annually for immunization to known sensitivity. This main group consisted of personnel from all divisions of the company, except one. For study purposes, this group was divided into two sub-groups. One of these was called the "Investigational Group" and consisted of 126 employees. Personnel in this group were asked to use "Ivy X" (term designated for tripelennamine cream with zirconium) exclusively without inoculations or any other means of prevention or treatment. The other sub-group consisted of 129 employees who were to serve as a "Control Group." Employees in the "Control Group" were permitted inoculations as in the past and they were asked to continue to use the preparations supplied by the company before the test. Between the two sub-groups participants were matched as to occupation and geographic loca-

tion as much as possible, to make the test situation comparable.

The second main group consisted of about 1200 Plant Department employees from the one division not included in the make-up of the first main group. "Ivy X" was made available to all employees on request and it was suggested that they use it exclusively without inoculations. No attempt was made to establish any particular form of scientific control.

Letters from the Medical Director were written to employees of all groups explaining the study in full and soliciting their complete cooperation during the trial period—May 16, 1953, to September 26, 1953. Detailed instructions, including the name lists, were sent to the administrative forces in the field trial. Separate forms were prepared and distributed for the Investigational Group and the Control Group of the first main group, and a third form was distributed to the second main group.

Under ideal circumstances all of the participants who were aware of definite exposure or who developed a rash from poison ivy contact would have been interviewed and examined in the company Medical Department. Because of the wide spread geographic distribution of the employees this was not practical. However, the local supervisory personnel were thoroughly acquainted with the purpose and plan for this field trial, and they were most cooperative in providing the Medical Department with accurate and carefully prepared reports. A small percentage of the total group were examined in the Medical Department because of circumstances relating to the extent and severity of the rash or their proximity to the available medical service.

Results of Trial

At the completion of the field trial period, the report forms were collected. The Accounting Department analyzed the results by machine accounting methods. This analysis showed that not all members of the Groups had exposures to poison ivy during the study period. The investigational group reported 538 exposures by 73 employees, or 7.4 per man, while the group using standard company preparations (Control Group) reported 729 exposures by 96 employees, or 7.6 per man. Among the Control Group there were 25 employees (representing 242 exposures) who received an inoculation for poison ivy during the year. A number of men from the Investigational Group requested inoculation, but for purposes of the test, the requests were denied. Consequently, there was reasonable assurance that the groups were matched with reference to the various degrees of susceptibility to poison ivy.

Results of Field Trial Comparing Effectiveness of "Ivy X" with Standard Company Preparations (Control Group)

	"Ivy X" Group	Standard Company Preparations
Developed rash after exposure	30%	21%
Use prevented ivy poison	65%	77%
Stopped spread of dermatitis	67%	42%
Controlled itching	89%	76%
Dried up rash	75%	63%

At first glance it would appear that the preparations currently used were more effective than "Ivy X" in the prevention of ivy poisoning. However, other factors to be considered in the evaluation of a prophylactic measure are discussed under "comment." The results indicate clearly that "Ivy X" is more effective in the treatment of poison ivy rash than earlier preparations used by the company. This is evident in connection with stopping the spread, controlling the itch, and drying up the rash. "Ivy X" appeared to be particularly efficacious in stopping the spread.

Out of the 1200 employees in the Central Division of uncontrolled test, 742 employees completed questionnaires and reported 458 exposures. Following 56% of the exposures there was no rash. From the group that developed poison ivy dermatitis 62% felt that "Ivy X" stopped the spread of the rash; 84% reported control of itching; 66% reported it to be effective in drying up the rash; and 70% considered it to be more effective than any other remedy previously used. The results here were comparable with the findings in the Investigational Group.

Comment

The survey results relating to the prophylactic use of this preparation are not conclusive. It has been our experience over a period of years that many employees tend to resist such use of any preparation or equipment for various reasons. This perhaps results from failure to understand the logic of the recommended procedure, lack of recognition of a potential exposure, or the natural desire not to appear timid to their fellow workmen. Specific observations made in the company Medical Department on a small group of employees susceptible to ivy poisoning have in nearly all instances supported the laboratory studies[3,4] which indicate that this product has merit as a preventive measure.

With reference to the therapeutic merit of the cream, the direct medical observations resulted in a distinctly favorable impression as it relates to control of spread and relief from discomfort from the rash. It is also significant that cross checking medical records on this small group with the field reports subsequently submitted supported the accuracy of the field observations.

Conclusions

On the basis of this field test, it was felt that tripelennamine cream with zirconium was superior to any other preparation used to date. As a result of this trial, a decision has been made to adopt Pyribenzamine Cream with Zirconium for use in prophylaxis and treatment of ivy poisoning in the New Jersey Bell Telephone Company.

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So Statistical

A DISQUIETING element in the array of observations which have been assembled pointing the finger of accusation at smoking as a cause of lung cancer is that it is so ample, yet it is so exclusively statistical. There are lacking observations of the pathologic process of which the statistics are only the supposed reflection. If smoking causes cancer in many individuals it does so in each one of these individuals separately and by way of some material physicobiologic process. One would expect a body of clinical and pathologic observations to have accumulated over the years suggestive of such a process. The notable lack of these, taken together with the abundance of statistics, should, in view of previous similar experience, arouse suspicion that we may be dealing with a purely statistical phenomenon related to the way the statistics were obtained. If cigaret smoking is so effective in causing lung cancer that one can see its evidence statistically so impressively in so short a time as 20 months as it is on view in the report of Hammond and Horn, then we can reason that it is a very potent cause. Why then cannot lung cancer easily be produced experimentally? If, to counter this question, it is argued, as it has been argued, that the cancer produced in the short period of observation is the result of a cumulative effect of many years of exposure to smoking, then one wonders why pathologists have not reported, from the enormous number of necropsies with careful tissue examinations which have been performed over the years, evidence of a profound chronic process which retrospectively could be allocated as the precursor of smoking-produced cancer. Since the American Cancer Society study shows cancer other than lung cancer to be associated with smoking, it is not only in the lung but in all cancer-susceptible tissues that such changes should be found. It is of course possible further to argue that the widespread cellular damage by smoking that is going on for years, is of a fundamental biochemical nature not visible to the pathologist and not yet discovered by the chemist, and that animal experiments are futile because humans are the only animals susceptible to smoking-produced cancer. But such explanations are hardly more than a restatement of the paucity of direct evidence. Moreover, even if the process of causation of cancer by smoking is "on the average" very long, say many years, still we should expect on the basis of observations of other biologic characters, that the period of incubation would be variable and that at least in a small proportion of cases it would be very short. Why then over the years have we not seen individual case reports of the appearance of fulminant cancer in association with acute exposure to smoking? I mention these few isolated questions merely to illustrate the general fact that clinical experience with individual patients is associated with smoking. If one can imagine all the statistical evidence, including that from vital-statistics reports, not to have appeared then I believe that there is nothing substantial in the record of clinical or pathologic observations on individuals that would have suggested smoking to be the cause of cancer. In these circumstances it seems premature to conclude definitely that it is the cause.

—From "The Statistical Study of Association between Smoking and Lung Cancer," by Joseph Berkson, M.D., in *Proceedings of the Staff Meetings of the Mayo Clinic*, 30:15, (July 27) 1955.

Attendance Motivations

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SICKNESS absenteeism is a minority problem. The chart (Chart 1) of the sickness experience at one of Esso's large refineries is fairly typical of other units and the Company as a whole. Fifty percent of the work days lost are accounted for by 5% of the employees.

Similar studies over longer periods show the same individuals reappearing in the excess absence group year after year. The corollary of this is that the majority of workers do not present an absenteeism problem. If we study this latter group, we discover that a number of factors motivate them to work:

1. The basic need to sustain life. The vast majority of us must work in order to eat, to be clothed, housed, support our families, etc.

2. The emotional desire to be useful. In addition to material reasons, most of us have an urge to produce something in which we take pride. In some cases this means doing something which benefits others rather than making a specific material product.

3. Habit. The basic training most of us receive from childhood ingrains in us the idea of work. In most a suitable balance of work and leisure is attained. Exaggerations of this desirable habit are seen in individuals who are disconsolate for want of something to do after retirement.

4. Sociability. For a few, work itself or the immediate gain from it is not as important as the social contacts which work brings.

5. Group Loyalty. For some the sense of belonging to a team effort is most important. This transcends the sociability factor mentioned previously. For such individuals the belief that the team will not function well without them overrides legitimate reasons for absence.

Techniques for determining work motivation are not difficult. The one that comes most readily to hand to the physician is that of environmental history taking. During a periodic inventory the discussion of previous work history, outside interests, marital history, etc., gives clues to work motives or opens natural lines of inquiry.

Returning now to the minority problem, what are the factors that motivate people to absent themselves on the grounds of "illness?"

1. True physical illness that deprives them of the capacity to work.

2. Emotional illness that renders it impossible for them to devote the necessary attention or concentration a job demands.

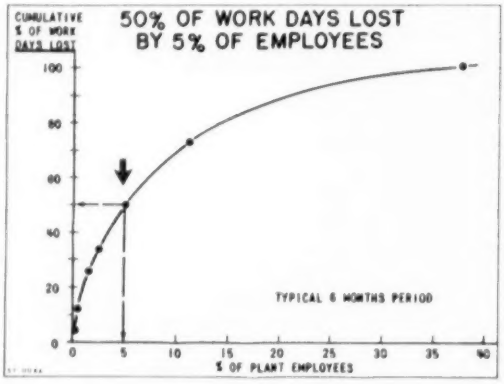

Chart 1.

3. Unfounded concern about their health that magnifies minor complaints to the point that they outweigh motives to work.

4. Actual dislike of work. Although many individuals in this group might be referred to simply as "lazy," other things enter into the picture. Improper placement or poor supervision may change enthusiasm for work to strong distaste.

5. Competition of other interests outside work. Energy which ordinarily might be devoted to work is diverted to home problems, such as marital discord or family illness; other business enterprises, such as farming, part-time shopkeeping or even other full-time jobs; excessive participation in leisure activities, such as sports of various kinds.

Now that we have reviewed various positive and negative factors bearing on work attendance, how can we use this knowledge to deal with a particular problem case? At this point we should realize that one person or one department cannot act alone. Unilateral action may work in isolated cases but for an effective plant program line management and staff groups must develop a coordinated approach. One that has been effective in various Esso units uses a committee consisting of line supervisors, plant management, employee relations, and medical representatives. More important to success than the exact organizational detail of such operating committees is the evidence of continued top management interest in such a program.

Presented at the Thirteenth Annual Meeting of the American Association of Industrial Nurses, as part of a Symposium on "How to Motivate Good Work Attendance," Industrial Health Conference, Buffalo, New York, Tuesday, April 26, 1955.

The committee's first step is to set up an arbitrary definition of excessive absenteeism for purposes of preliminary identification. Three, four or five separate absences, or a total of 20 or 25 days per year may be agreed upon depending on the plant location. More than one calendar year is surveyed to approach an average performance. Plant personnel records can be used for the guidance of the committee. The actual identification of problem cases should be the responsibility of each department head. His basic tool is his own work attendance record for each one of his people.

Study of absenteeism on a departmental basis at times does more than merely identify individual cases. It may furnish a clue to the effect of work environment on motivation. The following charts contrast the absence experience in two departments of the same refinery:

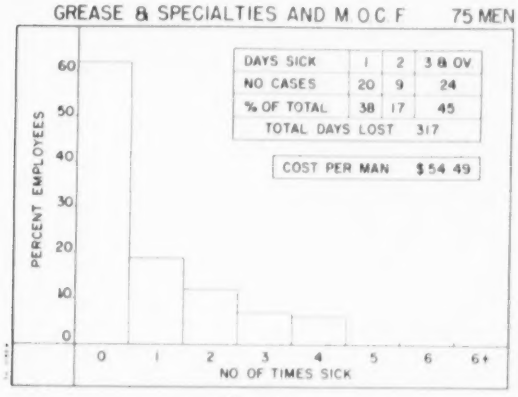

Chart II.

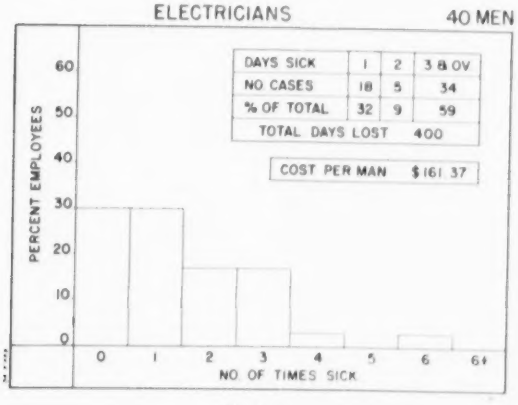

Chart III.

Where the factors of difference in age and the occurrence of unusual medical problems of long duration can be excluded one must still consider the possibility of health hazards peculiar to the job assignment. Corrective or protective measures can be instituted where indicated. By and large, however, we have found that factors of supervision and morale are more important than strictly health problems.

As the committee studies problem cases on its list, it should be able to determine the motives influencing each one. If medical information on a given case is inadequate, the individual should be referred by his supervisor to the Medical Department for further study. Provided the individual understands this is the reason for referral, the doctor can proceed without violation of the doctor-patient relationship. His report to the committee does not reveal medical data. It simply affirms that the man does or does not have adequate medical reason for his absence pattern. It also indicates whether he is seeking proper medical attention where needed.

Information provided by the members should permit the committee to answer the following:

1. Is the employee ill?
2. If so:
   - (a) The plant physician should answer the following questions:
     - (1) Is his illness a justifiable basis for his absenteeism, or is it merely an alibi?
     - (2) Is he under a physician's care? Does he follow the doctor's advice?
     - (3) Is his condition likely to improve or worsen with passage of time?
     - (4) Are his health and life expectancy likely to be adversely affected by continued work on the job?
     - (5) Is his absenteeism in any wise related to an industrial illness or injury?
   - (b) The supervisor should answer the following questions:
     - (1) Is he an effective and desirable employee despite his illness?
     - (2) Is he in a job where his suboptimal performance due to poor health may contribute to or cause substantial deviation from optimal productivity of a production unit or department?
     - (3) Can he be used effectively in some other assignment more nearly compatible with his physical or emotional limitations?
     - (4) Is the employee eligible for retirement under any of the company plans?
3. If not ill:
   - (a) Is his absenteeism typical of his department? If so, what environmental factors (physical, social, or psychic) are influencing his and his associates' lack of enthusiasm for the job? Can these be corrected?
   - (b) Will reprimanding or other disciplinary measures on one or more occasions change his attitudes?
   - (c) Should he be discharged or retired for the good of the service?

The answers to these questions provide guides by which certain steps can be taken to alter the unfavorable balance between positive and negative motives toward work. The members of the committee play roles of varying importance depending on the motive being worked on.

Where major physical or mental illness is the chief causative factor, the doctor naturally becomes the prime mover. Significant decrease in the number of absences and shortening of recovery time where these occur are frequently effected by the efforts of a company sponsored consultant and a cooperative family doctor.

Individuals whose motivation to work is neutralized by excessive concern about themselves are dealt with by the Medical Department and management. The doctor develops a complete health picture of the employee and discusses it with him. Reassurance that his health is sound, frequently helps the latter gain proper perspective. The supervisor, knowing that he is not dealing with a sick person, can point out how poor attendance is an index of poor performance. In many instances this is the first time such people have viewed themselves objectively. Strengthening of their positive motives to work often results.

Where poor attendance reflects an employee's active dislike for or disinterest in his job, the supervisor assumes a major role. Improved understanding and action on his part can often remedy improper placement or inadequate supervision. At times the plant physician can help supervisors to understand their own personality problems and thus improve their effectiveness. If adjustment between supervisor and employee is not successful, interdepartmental transfer may be the answer.

The doctor can frequently be of help to the employee who dislikes his job. If the latter has confidence in the doctor, non-directional counseling may be very helpful during this difficult transition period. Where no solution within the company is possible, the employee may reach a mature decision to try his fortunes elsewhere. If such a decision must be made at least the employees good will may be preserved.

The problem of competing interests outside the job is also one for the supervisor. Frequently this is a matter of reacquainting the employee with his positive motives for working. Where the problem involves factors in the workers' family, no one in the company should play too active a role. Helpful leads to agencies equipped for this work should be made available. Practically every community has some organized group which can offer qualified counselling or practical help in these fields. Employee Relations and Medical Departments should know where an employee can be referred for such services.

The lesson we have learned from this program is not new. The most effective approach to a problem as complex as sickness absenteeism involves full cooperation between line management and staff groups. In the past the absentee has been able to dodge back and forth from supervisor to doctor or employee relations man. Each one of these saw only one aspect of the case in question and rarely did they move in concert to attempt to solve it. The group approach has helped greatly to change this picture.

Certainly the program outlined here will not eliminate sickness absenteeism. People will still continue to fall ill and be unable to work. Others will be disciplinary offenders or victims of poor morale and fail to work because of it. We do feel this method permits us to separate the various groups more accurately. With this knowledge we certainly should be able to reduce *unjustifiable* sickness absenteeism if we have the will to do so.

Summary

WORK attendance is a reflection of the interplay of positive and negative motives to work. The positive motives include the basic need to sustain life, the emotional desire to be useful, habit, sociability and group loyalty. The negative motives are serious physical or mental illness, unnecessary concern about one's health, active dislike of a particular job and the competition of interests outside work.

A cooperative effort by line management, Employee Relations and Medical Department people is needed to determine the motives in a given problem case. Once these have been determined, the positive factors can be strengthened and the negative ones weakened or eliminated. This is a matter for action by the various members of the team singly or in concert depending upon the motives in question.

In the final analysis chronic absentees are individual problems requiring individual solutions. Any program designed to deal with absenteeism must have the flexibility to deal with individual people, not check numbers.

(15 West 51st Street.)

Social Science

IT MUST not be thought that all that is needed for world salvation is a stiff dose of social science, no matter how well documented empirically and no matter how well integrated analytically. The rise of social science presents man with problems of an ethical and spiritual nature of which he is still for the most part not aware. The spectacular "success" of the physical sciences in expanding the power of man, both for good and for evil, is dramatically symbolized in the atom bomb. The worst that a physicist can do for anybody, however, is to cause pain and death. The social scientist, when he knows a little more, may be able to destroy the soul, that inner core of freedom and integrity which constitutes at once the humanity and the divinity of man.

—From "Religious Foundations of Economic Progress," by KENNETH E. BOULDING in *Harvard Business Review*.

Ford Medical Conference

FORD MOTOR COMPANY physicians held their first Company Medical Conference at Detroit, May 17-21, 1955. Under the leadership of EARLE A. IRVIN, M.D., Company Medical Director, the Conference filled five days, the first three given over to discussions pertaining to Records, Examinations, Noise and Hearing, Dentistry, Industrial Hygiene, Injuries, Diagnosis, and other subjects of primary interest in industrial medicine. Then followed a two-session scientific program on "Medicine in Industry," arranged by the Staff of Henry Ford Hospital and Clinic. The Conference schedule was comprehensive, and included many short presentations rather than exhaustive studies of particular problems. In addition to the lecture sessions, there were inspection tours of the Rouge Plant, Greenfield Village, the Henry Ford Museum and the Engineering Staff Medical Department. Forty-seven physicians, from Ford Company operations in 36 cities in the United States and Canada, were in attendance. Friday night the Ford Physicians' Banquet was held at Grosse Point Yacht Club. "Remarks" by JOHN BUGAS, Ford Vice-President, Industrial Relations, were read by DR. IRVIN. Present at the Conference but not in the picture were: H. L. STERN, M.D., Rouge; B. J. SAUBER, M.D., Rouge; B. Y. ONODA, M.D., Rouge; C. F. OMAN, M.D. Rouge; W. A. DAWSON, M.D., Rouge; D. V. AULD, M.D., Rouge; L. H. TOMLINSON, M.D., Monroe Plant; J. SALOMON, M.D., Highland Park Plant; K. W. KELLER, M.D., Canton Forge Plant.

Front Row (left to right): F. B. Knapp, M.D., Rouge; M. F. McGavin, M.D., Ford of Canada; J. H. Weidner, M.D., Engineering Staff; W. O'Hare, M.D. Rouge; C. J. Clark, M.D., Ford Division General Office; F. T. Bower, M.D., Mound Road Plant.

Second Row (left to right): F. J. Brylski, M.D., Buffalo Assembly Plant; G. U. MacKenzie, D.D.S., Rouge; E. C. Segerson, M.D., Memphis Assembly Plant; D. L. Block, M.D., Rouge; E. A. Irvin, M.D., Medical Director; H. L. Krieger, M.D., Central Staff; E. C. Falk, M.D., Ypsilanti Plant; D. V. Dougherty, M.D., Cleveland Engine Plants; F. Haverly, M.D., Green Island Plant; C. F. Schilling, M.D., Cincinnati Automatic Transmission Plant.

Third Row (left to right): W. D. Hall, M.D., Livonia Automatic Transmission Plant; J. T. Andrews, M.D., Buffalo Stamping Plant; G. C. Davis, M.D., Atlanta Assembly Plant; J. A. Proffitt, M.D., Norfolk Assembly Plant; S. W. M. Robinson, M.D., Chicago Assembly Plant; W. W. Mockett, M.D., Edgwater Assembly Plant; M. H. Lutz, M.D., St. Louis Assembly Plant; N. F. Sprague, M.D., Los Angeles Assembly Plant; W. S. Cheney, M.D., Long Beach Assembly Plant; C. H. Foshee, M.D., Louisville Assembly Plant; A. J. Fanta, M.D., Cleveland Stamping Plant.

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Bronchial Asthma and Asthmatic Bronchitis in the Chemical Industry

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BRONCHIAL asthma is present in about 5% of the working population[52] and is therefore responsible for substantial losses in skilled personnel in industry. As an occupational disease, it has long been recognized by clinicians. Ramazzini[10] noted in 1700 the occurrence of asthma and vasomotor rhinitis in bakers and millers working with flour dust. In 1888 an asthma epidemic was described in a German factory where the dye, paraphenylene-diamine (ursol) was being used.[53] Von Criegern[55] observed in 1902 that one-third of the workers engaged in fur-dyeing developed typical asthmatic attacks after short exposures to ursol. Curschmann in 1921[21] pointed out the actual allergen in such cases was not the dye itself but an oxidation product. Other cases of allergy to ursol have been reported by various investigators.[42,53,15]

Numerous other chemicals responsible for industrial asthma syndromes are mentioned in the literature, e.g., industrial solvents,[56] platinum compounds,[35,40] hydrogen peroxide,[14] gum acacia and isopropyl alcohol (printer's asthma),[26] phosgene,[8] nitrous gases,[31,38] acid fumes[29,44,45] and chlorine,[58] among others.[59,60]

Of special value to purposes of this paper were two reports by Sassi. In the first (1952),[50] 20 cases of acute or subacute poisoning with phosphorus trichloride are presented. The symptoms consist of asthmatic attacks following one to eight weeks of subacute exposure, nocturnal dyspnea, catarrh and irritation of the pharynx. Pulmonary emphysema developed after one to two years of employment. In the second paper (1954),[49] Sassi described 20 cases of chronic or acute poisoning with phosphorus oxychloride. Chronic exposure to this compound resulted in acute dyspnea and asthmatic-type bronchitis. Sax[11] mentioned that PCl_3, PCl_5, and $POCl_3$ are irritating to the eyes, skin and mucous membranes and that they may cause pulmonary irritation resulting in cough and asthmatic breathing. The phosphorus contained in these compounds is probably not responsible for the toxicity encountered since phosphates and red phosphorus are not nearly so toxic as are the reactive phosphides $POCl_3$, PCl_3, and PCl_5.[4] The basic toxic mechanism involved here is probably the formation of highly irritating hydrochloric acid on contact with the moisture contained in the respiratory tract.[11]

The purpose of this paper is to report a study made of the occurrence, etiology, clinical picture and prognosis of bronchial asthma and asthmatic-type bronchitis in a modern chemical industrial establishment.

Material and Procedure

THE PRESENT paper consists of two parts:

A. A statistical study of the occurrence of bronchial asthma and asthmatic-type bronchitis was conducted in the various departments of a chemical concern in Basel. The material used is the following:

1. Nine hundred and sixty-five case histories of the plant Medical Department where employees working with dangerous materials were periodically examined at half-yearly to yearly intervals.

2. Reports of the chemists in charge of the various involved processes as to the nature of the chemical substances utilized.

B. Medical study of 70 employees in the plant with manifest signs of bronchial asthma or asthmatic-type bronchitis. Of the 70, two held executive positions, eight were laboratory workers, and 60 were manual laborers or craftsmen of divers types. The age of the group varied from 25 to 64 years (average 47 years).

The workers comprised a heterogeneous group as far as the type of work performed is concerned. Most had worked in a number of different departments at various jobs, and nearly all had come in contact with numerous active materials during the working hours. The principal agents with which the workers had prolonged contact are:

1,2-dichlorethylmethylether ($CH_3ClCHClOCH_3$, brief dichlorether).
Inorganic phosphorus-chloride compounds ($POCl_3$, PCl_3, PCl_5).
Aldehydes.
Acid vapors.
Nitrous gases.
Solvents (aliphatic and aromatic hydrocarbons, chlorinated hydrocarbons, etc.).
Halogens.
Phosgene.

Prepared as a doctoral dissertation, University of Basel Medical School, Basel, Switzerland, August, 1955.

Aromatic amines.

At the time the study was conducted, 24 members of the group had been transferred from their usual place of employment to less exposed areas of the plant, a measure instituted to relieve asthmatic distress.

The examinations included the following:

1. History:

(a) Previous illnesses.

(b) Occupational history: number and type of acute poisonings, listings of all departments worked in, all compounds providing exposure. In every case the information obtained from the worker was added to that obtained from the chemists in charge of the several processes.

(c) History of present asthmatic distress, including records of the plant medical department.

2. Medical Examination:

(a) Subjective complaints.

(b) Objective findings: general physical examination, vital capacity determination, erythrocyte sedimentation rate.

(c) X-ray examination of the chest.

(d) Blood status.

Observations

A. STATISTICAL STUDY:

Of a total of 965 periodically examined employees, it was found that 132 (13.7%) suffered from bronchial asthma or asthmatic-type bronchitis. To determine specific etiologic agents, the many chemical substances were divided into eight groups. Among the workers who came in contact with a given group, the incidence of asthma or asthmatic-type bronchitis was determined. The results are listed in Table I. Many of the workers had been in contact with substances belonging to different groups.

TABLE I.
TOTAL NUMBER OF WORKERS EXPOSED TO GROUPS OF HAZARDOUS MATERIALS AND NUMBER OF ASTHMATICS IN EACH GROUP

Group	Total number Workers Exposed	Percent of Total Work Force	Number of Asthmatics	Percent of Asthmatics based on Total Number Exposed
I	533	55.2	59	11.1
II	510	52.8	58	11.4
III	170	17.6	48	28.2
IV	55	5.7	9	16.4
V	61	6.3	10	16.4
VI	140	14.5	27	19.3
VII	43	4.5	7	16.3
VIII	68	7.0	27	39.7

Code:

I. Aromatic Amines.
II. Solvents.
III. Volatile Chlorides ($POCl_3$, PCl_3, PCl_5, etc.).
IV. Phosgene.
V. Nitrous Gases.
VI. Volatile Acids and Bases.
VII. Formaldehyde.
VIII. Dichlorether.

B. MEDICAL STUDY:

1. Case histories:

(a) Previous illnesses: Respiratory tract pathology, such as tuberculosis, bronchitis, pneumonia, pleuritis, tonsillitis, sinusitus, or nasal polyps, was found to have occurred in 29 cases (41.4%) before the start of the asthmatic distress. Two employees already had moderate bronchial asthma before they started working in the plant. The first stated that the asthmatic distress (cough, espectoration, dyspnea, nightly attacks) began five years before the period of employment, following a severe pneumonia. The second suffered from dyspnea, tightness of the chest and asthmatic attacks at night one year before employment, after an acute bronchitis. Evidence of allergic disease (asthma, hay-fever, rash, vasomotor rhinitis, food sensitivity) was found in 27 workers (38.6%) and also in 13 families (18.6%).

(b) Occupational history: Nineteen workers (27.1%) had survived one or more episodes of acute intoxication (inorganic phosphorus-chloride compounds, phosgene, aniline, lead fumes, acid vapors, chlorine, carbon-monoxide, hydrogen sulfide, formaldehyde, etc.). In eight cases (four P-Cl compounds, one H_2S, one aniline, two unknown) the acute intoxication marked the beginning of the asthmatic distress.

(c) History of present illness: All the patients with two exceptions developed asthmatic respiratory tract symptoms for the first time during the period of employment. With the exception of the eight patients acutely intoxicated, the disease developed gradually with dyspnea, cough and expectoration. As for the two workers mentioned above with asthmatic distress prior to employment, the respiratory tract symptoms increased progressively during the time employed.

The period of exposure (from the start of the period of employment to the first manifestations of respiratory tract disease) varied greatly and averaged 13.5 years in the examined group. Its distribution is shown in Fig. 1 for 68 workers. Half of the asthmatic workers became sick during the first 10 years of employment. Sixty-six were smokers.

2. Medical examinations:

(a) Subjective complaints: Twenty patients (27.6%) suffered from acute, typical, dyspneic nightly asthmatic attacks. Fifty-two (71.3%) had periods of dyspnea during the course of their

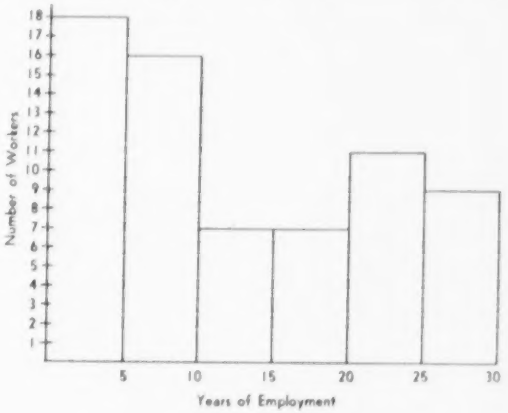

Fig. 1.
Latency period distribution, 68 workers.

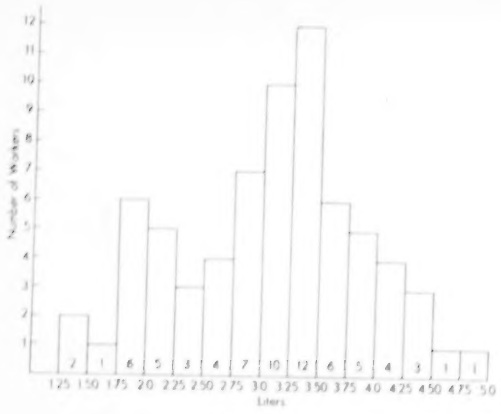

Fig. 2.
Vital capacity distribution, 70 workers.

work when walking up stairs or during periods of stress. Twenty-three (32.9%) were dyspneic when resting. Forty-four (62.9%) coughed chronically and of these, 37 (52.9%) produced mucoid, grayish-white sputum, usually viscid. In the last group, two patients indicated that the sputum was often bloody.

Twenty-nine (41.4%) maintained that the symptoms varied according to prevailing weather conditions. Most of the exacerbations were experienced during periods of changing weather or of dampness.

Twenty-six (37.1%) suffered from occasional attacks of headache and vertigo, often associated with coughing paroxysms, or on bending.

(b) Objective findings: Nine patients (12.8%) were cyanotic at the time of examination. Clubbing of the fingers was never observed. The presence of emphysema as judged by thorax form and rigidity and by auscultation and percussion was noted in 14 cases (20.0%). In these 14 patients asthmatic distress had been present for an average of 9.5 years as compared with an over-all average of 5.1 years for the group. Vital capacity was reduced to less than 3.5 liters in 50 of the examined. The vital capacity distribution is indicated in Fig. 2.

The following symptoms of chronic bronchitis were observed: Wheezing, rhonchi and dry rales in 54 patients (77.1%); wheezing, rhonchi and both dry and moist rales in 61 patients (87.1%); moist rales alone in four patients (5.7%). Clinical diagnosis of bronchiectasis was made in two cases.

(c) X-ray examination: X-ray findings added little to the clinical picture already obtained. In 13 cases the diagnosis of emphysema made on the basis of prior auscultation and percussion was corroborated. Twenty-one of the chest plates presented no pathological findings. In nine of the chest plates the hili were enlarged or not sharply defined, and the vascular markings were increased. One of the plates indicated a diffuse bronchitis, and the remaining plates exhibited various slight changes that did not contribute to the present study.

(d) Blood status: Erythrocyte sedimentation rates were elevated in 15 cases to 10 mm. or above in the first hour; the remaining cases all were less than 10 mm. in the first hour. Red cell count, white cell count, hemoglobin and color indices were within normal limits. Differential white count revealed a slight increase in band neutrophils in five cases. Eosinophils were increased above the normal range (above 400 per cu. mm.) in 13 patients (18.6%). However, it should be noted that none of the patients was examined during an acute attack or immediately following an episode of acute intoxication.

3. Clinical course:

As a result of moving members of the group to areas of the plant where exposure to offending materials was not so intense, and as a result of other therapeutic measures (inhalation therapy, temporary change to higher altitude) instituted by the plant medical department, respiratory symptoms disappeared in seven and were much improved in another four patients. The remaining 59 patients (83%) either retained the initial degree of distress or became progressively worse. Thirty-four percent of the patients had to be transferred to less strenuous jobs. In those 14 patients who developed emphysema, vital capacity was always less than 3.3 liters (average 2.4 liters).

Comment

A. ETIOLOGY:

1. Bronchial asthma and asthmatic bronchitis can be caused by inhaled substances, ingested foods, substances absorbed through the skin, bacterial infections, psychosomatic factors, etc. Any combination of these factors might have contributed etiologically in our cases. However, it is reasonable to assume that the inhaled substances played the most important role since all of the 965 workers were exposed to gases, fumes, dusts and particles in the working atmosphere in much higher concentration than is found generally, and since 13.7% of these workers were found to suffer from asthmatic distress as compared to only about 5% in the general working population.

2. Table I shows that the asthmatic bronchitis and bronchial asthma occurred most often after contact with the dichlorether (Group VIII). Exposure to this product was singularly clear-cut. The workers involved were in a separate section of the plant at a great distance from the rest of the operations and had no contact with other chemical substances. The large number of resulting asthmatics led to early recognition of the danger of the liberated dichlorether and also led to the discontinuance of the entire operation.

3. As to the remaining seven groupings, it may be noted that the majority are well recognized hazardous materials widely used industrially. The asthmogenic properties of most still require further investigation. The attempt to link any one group of substances to the widespread symptoms is difficult, since many sick workers had been exposed to substances from different groups. The highest morbidity rates encountered in the

study involved those workers exposed to the volatile chlorides (Groups III and VIII, Table I). The asthmogenic qualities of the phosphorus-chloride compounds is attested by the observations made of four workers who were acutely intoxicated by members of this group. None of these men had ever had any similar distress prior to the intoxication.

Descriptions of these cases follow:

CASE 1. Twenty-six year old, healthy laboratory worker; 10 years in plant; no previous respiratory tract disease. While working with $POCl_3$ inhaled vapors for several seconds. This caused immediate coughing, nausea and dyspnea. Examination by the plant physician showed prolonged expiration, wheezing and numerous dry rales diffusely spread throughout both lungs, and lacrimation. Chest x-ray and heart examination disclosed no abnormalities. After two weeks of bed rest, the condition was somewhat improved. At present, nearly one year later, there is present asthmatic bronchitis with occasional periods of dyspnea and severe cough. Vital capacity is 3.6 liters.

CASE 2. Sixty-four year old worker; 28 years in plant; with history of hay-fever, a single outbreak of eczema and a severe tonsillitis in his 57th year; otherwise no complaints. Patient inhaled $POCl_3$ vapor for a period of seconds and reacted at once with tightness of the chest, cough, dyspnea and vertigo. At present, one week after intoxication, pulmonary findings include prolonged expiration, productive cough and wheezing; the heart shows absolute arrhythmia and faint tones. Vital capacity is 3.6 liters. Patient complains of extreme fatigue and disturbed sleep.

CASE 3. Thirty year old healthy worker; three years in plant; no previous respiratory tract disease. In the accident, the neck of a bottle containing $POCl_3$ broke, the chemical spilled onto the patient's clothing, and the patient inhaled sparingly of the vapors for close to a minute. This resulted in cyanosis, tightness of the chest, dyspnea and vertigo. Examination by the plant physician indicated loud wheezing and numerous dry rales in both upper lobes. The patient was confined to bed for ten days. At present, six years after the incident, findings include prolonged expiration and dry rales in the upper lobes. Patient still complains of cough and frequent dizzy spells. Vital capacity is 3.6 liters.

CASE 4. Twenty-nine year old laboratory worker with five years of plant service and a history of rash following contact with glacial acetic acid and an acute bronchitis. The intoxication involved the inhalation of PCl_3 vapors for several seconds and was followed by dyspnea, severe headache, vertigo and lacrimation. Examination by the plant physician showed prolonged expiration and wheezing that lasted for several weeks. No pathological findings can be detected at present, six years after the incident. The patient complains of tightness of the chest after physical exertion. Vital capacity is 4.5 liters.

4. The aromatic amines were more widely used than any of the other groups of active materials; 55.2% of the total working force was exposed to them. The resulting 11.1% of asthmatics indicate this is the group associated with one of the lowest morbidity rates in this study. The strongly asthmogenic ursols were seldom encountered in the present material. Exposure to numerous industrial solvents also was widespread. The morbidity rate for this group is the same as that for the aromatic amines. The toxicity of benzol, toluol and other solvents has been well described,[2,4,5,11] and it is likely that exposure to these might have contributed etiologically. The morbidity rate for the volatile acids and bases (19.3%) is somewhat higher than that for the preceding groups. It is known that these substances cause direct irritation and inflammation of surface tissues.[12,29,44,45]

B. CLINICAL PICTURE:

Clinically, there is no difference between the asthmatic bronchitis of the examined industrial group and that of the non-industrial population. The illness began either as a result of an acute intoxication or developed progressively over a period of years. The first symptoms were usually dyspnea, cough and expectoration. Often these were so pronounced that the patient was partially or totally unable to work. Objectively, there were present the symptoms of asthmatic bronchitis: prolonged expiration, dry and moist rales and emphysema of varying intensity with reduced vital capacity. It is not possible in these cases to ascertain from histories, blood status and clinical findings whether the chemical substances exerted an allergic or a toxic action.

C. PROGNOSIS:

The prognosis of industrial bronchial asthma and asthmatic bronchitis for these cases was generally poor, and the ability of the employee to perform his work often was permanently impaired. As a result of the instituted medical and industrial hygienic measures, it was possible in a small percentage of cases (17.1%) considerably to improve the condition of the ill workers. In the remaining cases, the symptoms continued over many years, even after contact with the hazardous materials had been eliminated. In this latter group, the working ability was often limited. The poor prognosis in these cases is in agreement with that cited in the literature. The poor prognosis and the inadequacy of the treatment of industrially caused asthma and asthmatic bronchitis emphasize the importance of prophylactic measures. Prophylaxis should consist of the following:

(a) Technical measures: Contact with substances damaging to the mucous membranes, especially volatile halogen compounds and acids should be minimized. This can be brought about by working with closed systems, proper exhaust and ventilation, working in open-air and by eliminating dangerous materials (e.g., dichlorether).

(b) Medical measures: Exposed workers should be examined periodically at least at half-yearly to yearly intervals. In the event that damage to the respiratory tract is found, immediate transfer to a less exposed area is indicated.

Summary

A STATISTICAL study of occurrence and etiology of asthmatic distress among 965 workers in a chemical plant in Basel was made. In addition, 70 workers with asthmatic bronchitis or bronchial asthma were examined medically. The following facts were established:

1. Thirteen and seven-tenths percent of 965 workers exposed to hazardous materials suffered from asthmatic bronchitis or bronchial asthma.

2. The highest morbidity rates were found in those workers exposed to the volatile chloride compounds, especially 1,2-dichlorethylmethylether, phosphorus oxy, tri- and pentachloride.

3. The exposure period varied greatly and averaged 13.5 years.

4. The clinical picture obtained does not differ from non-industrial asthma.

5. Prognosis was poor because of chronicity, inadequate therapy and possible complications (emphysema).

6. Ability to perform physical labor frequently was impaired.

7. In the absence of known suitable therapy, prevention through mechanical measures and medical supervision becomes essential.

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The Relationship Between Industrial and Private Practice

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AMERICAN business is fairly well into a humanistic phase. We first learned how to produce with machines. Management men found that machines weren't enough for the foundations of a successful and lasting organization. They may have learned this through their own natural, individual enlightenment . . . . the personal human instincts of management men have influenced the day-to-day decisions away from the traditional indifference to the human equation in business and towards an emphasis on good human relations. Or they may have been forced into the conduct of good human relations by competition or by public pressure — from customers, from employees, from stockholders, from government, or from the general public.

Either way, they learned that good human relations pay. American management men today —responding either to their own enlightened impulses, to competition or to public pressure— are conducting their businesses on a high plane of moral conduct where human relations are concerned. They are also beginning to try accurately to reflect this high plane of conduct for all the public to see through better public communication, i.e., to take rightful public credit that is due them. (This is complicated by the fact that many people cling to old, out-of-date impressions formed decades ago when human relations in business left much to be desired.)

This high plane of moral conduct is most accurately shown in the matter of industrial health and safety programs. No more intimate aspects of good human relations exist in business today.

Thus from the business management point-of-view industrial health and safety programs stem from either public pressure or the simple desire on behalf of business management to attain a high plane of moral conduct in their business operations.

We have commented on American management's viewpoint; now it is appropriate that we mention the attitude of some quarters in American labor. Not too long ago a prominent labor leader, speaking at an annual meeting of the American Industrial Hygiene Foundation, made the following statement:

"I would like to venture an opinion that some of these 'human relations scientists' are placing too much emphasis on the 'individual' aspect of the industrial scene and are too little interested in the 'group' phases. The unions represent the individual worker as a member of his work group.

"We have a hangover in our political and economic thinking which goes back to Adam Smith. This is the idea of 'economic man.' He was a sort of Robinson Crusoe, who lived all alone on his island, making every economic, political, and social decision all by himself. To the extent that this idea persists in the study of human relations in industry, it may itself become a human relations problem.

"We union people can tell you that man is a social being. He identifies himself with a group. He gives his loyalty to a group. His thinking and his acting are colored by the group or groups to which he belongs. Any effort to isolate the individual man — or the individual worker— on a laboratory slide, where he can be pushed and poked to find out what makes him tick, is futile and destined to failure."

This attitude, though not general in American labor, raises a serious question as to whether the American workman can be considered as an individual or must he always be considered "a head in a herd." In other words, is the individual worker "the vanishing American."

One can see that there is a fertile field in American industry for controversy between management and labor over the question of whether one or the other represents the best interests of the individual workman. In my opinion, this controversy has been beneficial to both management and labor by emphasizing the need for good human relations in industry.

The whole field of human relations has been of much interest to industry since the Hawthorne experiment. To date there is no reliable method of measuring human relations or employee attitudes in industry. When we consider the disastrous effects of frustrations and fear, due to human relations problems, I believe that the importance of arriving at some sort of human relations index in industry is apparent. No direct attitude, survey, or program can accomplish this. We have no concept today as to the amount of productive energy which is dissipated

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on the job because of conflicts in human relations. These conflicts lead to labor unrest and conceivably can lead to self-destruction of a company. They are reflected also economically and politically in a community. Any group schism in a company between management and labor is the sum total of individual schisms among employees and/or supervisors and foremen.

The most valid approach so far to this problem has been through the concept that "people act in what they feel the best interests of themselves, their families, and/or others whose welfare they have at heart." For an employee to be receptive to another employee, or to a supervisor, or to any group of employees, he must first seek proof that his self-interest is being served. This employee thinks and acts in terms of benefits which these people can bring to him. The employee expects the company, and his fellow-employees, supervisors, and unions to bring him benefits. If he feels that the company is unwilling or unable to bring them he will seek leadership outside of company management. This would also apply to his relationship with a supervisor, to another employee, or to a union. Any appeal to a worker or a group of workmen to listen to benefits involves emotion movers which also must be based on reason (coming from within the person making the appeal). There can be no quackery in these emotional movers if they are to succeed in gaining the workmen's favorable attention.

Employees also seem to be governed by the "need concept" which goes beyond usual material needs for food, clothing, and shelter and includes emotional security, recognition, or a feeling of "belonging" or being identified. Many of the conflicts on matters of human relations that we see have a possible solution in the above concepts of employee incentives. These concepts hold great promise in prevention of fears, frustrations, and anxieties on the job and add immeasurably to employee health and happiness.

Prevention of Disease and Disability

WE MENTIONED earlier that a good industrial health program is one of the clearest reflections of industry's interest in good human relations. If a company, through moral, economic, financial, or legal responsibility, has an industrial health program, the workman expects that program and the plant physician and nurses representing the program to bring him benefits.

Preventive medicine is the largest single benefit we bring to the employee in industrial medical practice.

The most important preventive measures are the various industrial physical examinations, which include: preplacement, periodic or annual, post-illness, and special examinations.

The purposes of these physical examinations are:

1. To facilitate placement of a worker in accordance with his individual physical or mental fitness.

2. To acquaint the worker with his physical status and to assist him in improving and maintaining personal good health.

3. To safeguard the health and safety of others.

Looking at these objectives it is evident that the worker benefits at the time of hiring by proper placement in a job compatible with his physical capacities. He benefits from advice as to correctible defects which, though minor at first, could be aggravated over years of service and reduce his working efficiency.

By reporting to his private physician for correction of these defects, he improves his health and increases his longevity, bringing long-range benefits to his family and community. The private physician benefits by early referral of the case at a time, in many instances, early enough to prevent irreparable damage. He is able to follow the case from the beginning and maintain proper medical control. The management of the plant benefits in the preplacement examination of the prospective workman in receiving advice, without the diagnosis, as to the individual's physical capabilities and limitations. This enables men charged with the responsibilities of management to place the worker in a job where he will not be a hazard to himself, to others, or to company property.

One may ask, "What if the physical examination results in the man not being hired? How does that benefit him?" In private practice as well as in an industrial practice, frequently there must be short-range losses brought to the patient in order to bring him long-range benefits.

I am certain that the average patient, confronted with the prospect of a surgical operation, does not consider this procedure as an immediate benefit, but as a loss, for many reasons other than financial. In numerous instances one has to counsel the patient regarding the long-range benefits of the procedure in preventing further complications or prolonged disability.

The situation is no different in industrial medicine, which today has become a science more of prevention than of cure. The industrial physician must counsel the employee with regard to accepting a short-term loss (i.e., the job) in return for a long-term benefit. To place a man in a job where he would be a hazard to himself or others, would aggravate his disability by occupational injury or disease. He would suffer disabling consequences which might affect his economic security later in life, which in turn would affect the welfare of his family and community.

On the other hand, by seeking employment in another, more suitable form of work, he will be better able to control his physical defect with the assistance of his private physician and feel more secure in a job which he is physically able to perform with ease.

The periodic or annual physical examination is another important preventive measure in an industrial medical program which yields many benefits to the employee, the employer and the

community. Its purpose is to counsel the employee throughout his working career, to assist him to improve and maintain good health. It also is a measure to safeguard the health and safety of others, and to discover and control the effects of possible unhealthful exposures in the working environment.

The periodic physical examination consists of:

1. Recording a complete medical history in addition to the health questionnaire filled out by the examinee.

2. Doing a routine evaluation of the various systems of the body which may include the laboratory procedures necessary intelligently to advise the employee as to the need for treatment by his private physician.

These examinations yield few temporary losses of position or income to employees. Only a small percentage of employees (less than .5%), with certain disabilities of a temporary or permanent nature, suffer temporary or permanent economic losses in reassignments, lack of promotion, or termination, because of physical condition.

On the other hand, all employees benefit by being apprised of physical defects early and, in most instances, before irreparable damage has been done. In preventing serious prolonged disability by this means, in most cases we keep the employee on the job at an optimal level of efficiency. He does not use up all of his sick leave, and he suffers little or no economic loss which would affect his family and community.

In effect, where these periodic examinations are concerned, we are operating a well-adult clinic where sufficient diagnostic study is made for the purpose of convincing the employee he does or does not require medical care. These examinations may disclose, for example, early cancerous and pre-cancerous lesions, communicable disease, early diabetes, overweight, coronary insufficiency, early hypertension. By doing a limited amount of preliminary laboratory study, we frequently are able to convince employees that they should go to their private physician. Some might otherwise delay such a visit for months or years. The physician in industry, therefore, benefits his employer and the community by keeping the maximum number of workers functioning at an optimum level of efficiency. He guides the employee into acceptance and correction of defects, and this is a major benefit to employees. He guides the employee, through these examinations, toward the use of the talents of the private practitioners in his community to keep his health intact.

The private physician benefits by more frequent contact with his patients and at a time when he is in a position, in many instances, through curative medicine, to prevent serious disability. Approximately 50% of our employees who are examined each year are found to have defects requiring correction and are referred to their private physicians or dentists. This phase of industrial medicine can properly be called preventive, constructive, educative, and/or anticipatory medicine. This is in contradistinction to curative medicine which is the primary responsibility of private practitioners.

Let me inject here a few words concerning ethical referrals from an industrial Medical Department. In directing employees to outside medical care it is our policy to avoid referrals to a small or limited group of physicians. If they have no family physician we suggest the names of at least three qualified physicians, conveniently located as to the employee's place of residence. The employee makes the choice of one of these three names, which are taken from the directory of the local medical society.

The part-time plant physician is often in a difficult position in protecting relationships with colleagues in private practice. How he handles these relationships depends on his individual capacity, by personal endowment, to be always circumspect and show good judgment in accepting private patients from among those employees that find their way to his private office when he is off duty from the plant. He must observe the same code of ethics at the plant as is required in private practice. Our part-time physicians are cautioned on this and we keep a watchful eye on referrals from the plant.

Non-Occupational Illness and Injury

GENERALLY speaking, we can approximate the cost of non-occupational absenteeism in any company by multiplying the number of employees by $70.00. For example: A company with 10,000 employees may expect that its absenteeism would cost $700,000 per year. Let's assume that a good preventive medical program could achieve a reduction of 29.7%; the savings to this company would be $207,900 per year.

Many large employers have benefit plans which indemnify employees for lost time due to non-occupational injury or illness. Some states, such as New York and California, have laws providing for benefits to employees where there is unemployment due to disability. Many large employers also provide group life insurance policies, and their actuarial experience with these policies is affected by non-occupational illness and injury. There are also medical and hospitalization plans where there must be some control of loss ratios due to non-occupational illness or injury.

It is an advantage, therefore, to management to have a healthy working force, and it can be said that the incidence of non-occupational illness and injury in any industrial concern is a reflection of the adequacy of management and employee relations, over-all efficiency, and basic morale.

Years ago when the management of a company evaluated its Medical Department, it was primarily on its ability to minimize the cost of medical care in workmen's compensation cases. The advent of preventive medical programs and accident prevention programs has developed safety, industrial hygiene, and preventive engineering to a high level of performance. This has changed the whole picture, so that work-

men's compensation costs now account for a very small portion of the total cost of illness to industry.

In certification of sick benefits under sick pay plans, we rely heavily on the private physician for his diagnosis and an estimate as to when disability started and when it will end. The private physician, by virtue of the patient-physician relationship, is a champion and advocate of his patient's welfare. To a busy practitioner, certifications become a chore. In these days of voluntary health insurance, unemployment compensation, disability insurance, sick benefit plans and other plans related to employees' health, the average practitioner is deluged with papers to be certified. In many situations he must risk one of several possibilities: an irate patient; loss of the patient's confidence; unwittingly becoming a partner to some unjustified claim of illness. Equanimity must be displayed by industrial physicians in matters concerning the certification of illness. In the majority of questionable cases, personal contact with the private physician will explain or justify many situations that are not justified on paper. Any attempt at "second guessing" on the part of the industrial physician is hazardous.

I need not emphasize that "rubber-stamp" certifications by private physicians are not only harmful to morale, but also make no contribution to the worker's mental health. There are some cases where we must recognize "the adult version of the boyhood headache which allows baseball on Saturday but prevents church on Sunday." Close cooperation with industrial physicians can help to maintain smooth patient relationships for private practitioners in these difficult situations.

A plant physician frequently examines a workman returning to the job after a serious illness. Some of these cases involve conditions such as coronary disease and cerebral accident, and patients may ask to be returned to work by private physicians prematurely because of economic factors which outweigh medical considerations. In such instances, the plant physician should have the final responsibility for determining the patient's physical limitations as they relate to his placement on the job. The plant physician is in a better position to understand the job requirements, working conditions, or occupational hazards in a given plant. He is also aware of the number of light duty or modified duty jobs available, and can discuss with the Industrial Relations Department placement possibilities for the employee. We feel that this arrangement is a benefit to the employee in the prevention of further aggravation of his disability. It is also a protection to the company from the standpoint of occupational aggravation of a pre-existing disability.

In such instances the plant physician may contact the private physician and furnish necessary information on job requirements, working conditions, or occupational hazards. The private physician is then in a better position to discuss with his patient the need for further treatment and observation before returning to work. On the whole, we have found that this procedure establishes good relations with physicians in the community and strengthens the physician-patient relationship.

Curative medicine for personal or non-occupational illness is not the proper concern of management in most companies, especially at a time when paternalism is looked upon as a possible stepping-stone to a loss of personal freedom.

Most large companies have arrangements for medical and hospitalization coverage of their employees. This coverage is furnished either through local physicians' service plans or through commercial insurance carriers. Management's main concern in medical and hospital insurance is to see that the employees are able to obtain some type of coverage which will best meet their needs. Private physicians have serious responsibility in seeing that these voluntary health insurance plans are not "worked to death." They represent the last chance for organized medicine to prove that voluntary health insurance brings the right type of benefits to the majority of the people. If we fail in this we will have asked for socialization of medical care.

Older Age Groups and the Physically Impaired

MUCH is being said these days about employment of older age groups and the physically impaired. Industrial medicine has progressed a long way in coming to the realization that we must consider a man's abilities rather than his disabilities. This concept applies to the hiring of older workers. Our approach to this concept must still be tempered by realism and consideration of the employer, since in most states the aggravation of pre-existing disease or disability is compensable under law.

During World War II systems of placing older and physically impaired workers were developed by the combined efforts of industrial psychologists, safety engineers, and industrial physicians. On the whole, during the war years, these systems have proved reliable and valid approaches to the problem of hiring physically impaired and older persons, making them safe and productive workers. They have not solved certain basic problems of employment related to workmen's compensation insurance involving the self-assured plant or the carrier and decisions of industrial commissions. These problems have a direct bearing on development of protective hiring practices under which an employer seeks protection against the risk of aggravation of disease or defect existing prior to employment.

Under present liberal trends in policies in the administration of workmen's compensation laws precedents have been established time and time again by decisions holding employers or their carriers liable for total pathologic change when competent medical evidence has proved advanced stages of physical or mental disease in a claimant prior to employment and alleged injury.

Liberal trends in rulings of accident commis-

sions have far-reaching implications in employment policy and over a period of time often react to the detriment of the older working man and or those with physical impairment or emotional disorder seeking employment in a competitive labor market. Protective hiring practices, rendering useless any system of job placement of physically impaired persons, crop up and impede both state and Federal rehabilitation programs. During the war restrictive employment policies were less evident because of the cost-plus basis of production and war risk insurance. They are now becoming more evident during the reconversion period. Industrial accident commissions, labor officials, insurance carriers, employers, industrial physicians, and rehabilitation authorities should exert every effort now in working out an equitable plan to deal with the general problem of aggravation of physical or mental impairments resulting from employment, so that employers can judiciously place persons with impairments without being unduly penalized.

In 1943, in collaboration with Dr. Harvey, I studied relationships between physical impairment and job performance, including the important aspect of accident experience of the impaired person with particular reference to second injuries. We found that in private industry the essence of the problem of hiring the impaired worker lies in whether the employer or his insurance carrier may possibly have to bear the burden of cost of second injuries, thereby adversely affecting the employer's or the industry's experience. In this connection rating plans and rules, though not devised according to physical characteristics of workers in a plant, are affected by poor experience in insurance loss, leading eventually to a higher rate. Further, in a participating type of plan an employer with poor experience may lose savings in dividends on a policy. Several or even one severe loss may condition the employer against employment of physically impaired and older persons.

Second injury funds offer the best solution at present in protecting employers and their insurance carriers from second injuries among employees. Out of these funds is paid the difference between compensation received by the worker for the second injury and compensation payable for the disability resulting from the combined effects of the first and the second injury. The funds have great value in cases such as when the loss of one hand, foot or eye is followed by an injury which destroys the other member. They have little or no value when there is a question of aggravation of a pre-existing disease or defect. In the latter category one must give serious consideration to disabilities which may be progressive, such as certain neuropsychiatric, cardiovascular and pulmonary diseases, diabetes and arthritis. The aggravation of these disabilities on an occupational basis has been overvalued, and employers or their carriers are too often penalized for the total pathologic change, much of which was not incurred in employment, and held liable for disability without apportionment. Both private and industrial physicians should be diligent in seeing that persons with certain disabilities are not placed in jobs where there is the hazard of costly aggravation of these disabilities.

Teamwork Between Industrial and Private Physicians

THERE have been misunderstandings in the past between private practitioners and industrial physicians. These were engendered by a feeling that industrial physicians are engaged in "contract medicine." A large segment of the medical profession feared industrial medicine would make inroads on the family physician and disturb physician-patient relationships by the injection of a third party. Misunderstandings, to a large extent, have disappeared. The medical profession now recognizes the increasing importance of this specialty.

There actually can be no real distinction drawn between the work of industrial physicians and the work of private practitioners. Every physician practicing medicine gives service to industry at some time, whether it be only treating a small businessman—the grocer, the baker, the farmer, the merchant, the banker. Every physician, whether in private or industrial practice, must at some time apply principles of occupational medicine in the treatment of his patients. The private patient, even though a housewife, is a worker subject to occupational hazards and to disabilities which may affect the efficient performance of her household duties. When you advise a housewife to avoid certain types of physical exertion because of a cardiac disability, or to avoid contact with certain household solvents because of an atopic dermatitis, you are practicing an important branch of occupational medicine—rehabilitation. Whose loss as a worker is more keenly felt than that of the handicapped homemaker?

In future, all physicians will be called upon more and more to practice rehabilitation or occupational medicine. Those who have read Dr. Howard A. Rusk's book, "Living with a Disability," know that a whole new field has been opened up in handling patients with disabilities, in order that they may pursue a maximum number of their ordinary activities or duties. Can we say we are doing everything possible for cases of severe arthritis if we do not advise patients about aids available to make their daily lives more productive and more livable?

The total adjustment of an individual to his health and environment should be of equal interest and importance to men in both industrial and private practice. An employee who leaves work and reports to the doctor's office in his overalls is called an industrial case. The same individual, dressed in street clothes, reports to a private physician and is considered a private patient. There has been, through industrial and economic development, an imaginary division of responsibility for this individual's health and welfare. If he suffers injury or disease resulting from occupation, he is called "an indus-

trial case." If he suffers disease or disability having no relationship to his employment, he is called "a private case." In truth, however, he is one individual. His attitude toward his disability shows no clear-cut division regardless of responsibility for his medical care. By the same token his attitude toward the medical profession recognizes no lines of demarcation as to industrial or private practice. If he gets caught in a "bind," due to misunderstanding between the two, both branches of medicine suffer loss of prestige, of acceptance, and of effectiveness.

An employee spends one-half of his waking hours at work. The trauma he receives at work, whether it be physical, psychologic, or mental, is bound to affect his after-working hours. By the same token, his relations in his home, his neighborhood, his church, and his preoccupation with personal illnesses and family problems, are bound to affect him on the job. If his wife throws the breakfast dishes at him—and connects—we might arbitrarily classify him as a "private case." If she misses and he retreats to his job to become, as a result of his preoccupation with his personal troubles, the victim of an accident, do we gain by arbitrarily classifying him as an "industrial case"? This individual does not leave one personality or set of experiences behind and take another with him into the plant when he punches the time clock for his shift. On leaving the showers of the change room after shift, though he has washed away the dirt and grime of a day's work, his suppressed hostility, frustrations and anxieties during working hours may go home with him. Watch some factory workers or some school teachers as they drive their cars away from their places of work to see vivid examples of this.

The private doctor and the industrial physician have a common responsibility to bring benefits to the "total" or the "whole" man. To do this, as much consideration must be given to work and its inherent hazards (physical or psychologic), as to medical history and physical complaints. Every medical history on a private patient should include the questions, "Where do you work?" and "What do you do?"

There must be, therefore, a good understanding between the private and the industrial physician as to how these two branches of medicine can work as a team toward a common goal.

Occupational Illnesses and Injuries

WE MENTIONED briefly under industrial physical examinations relationships between industrial Medical Departments and private physicians. Some mention of this relationship was also made in the discussion of sick absenteeism. There are likewise important relationships in connection with industrial diseases and injuries.

As the industrial field becomes more complex, and as the people in it become more accident-prevention minded, it has logically followed that the field of environmental hygiene is becoming increasingly important to the industrial physician. Here again the medical man's special training enables him to bring benefits to the company, the employee and the community. New processes involving new chemicals are being developed every day to produce new and better products for the public. This is especially true in the oil industry where constant research is in progress to improve petroleum products. This trend is indicative of economic health and brings benefits to the employee, the company, and the general public. The refining of petroleum, however, requires the vigilance of safety and industrial hygiene engineers and industrial physicians in order to protect the health of the employees as well as the consumer public.

A modern refinery, operating properly, is a well closed system of pipes and tanks where crude oil is subject to heat and various catalytic reactions in order to produce different fractions or products ranging from coke to high octane aviation gasoline. Some of the common chemical compounds used in the refining of crude petroleum are sulfuric acid, hydrofluoric acid, sulfuric dioxide, litharge, amorphous alumina and silica clays, and various caustic solutions. These substances are used as catalysts in refining petroleum or in the treating of refined petroleum in order to remove objectionable substances. In the process of refining, various gases are produced which can be detrimental to health if liberated in work areas in sufficient concentration. The most important of these is hydrogen sulphide.

The elimination and control of occupational hazards, due to various gases, solvents and dusts, is a responsibility of the Medical Department working with other departments concerned in the corporation. Through industrial hygiene measures these hazards usually remain under control. Occasionally, in the repair or maintenance of a unit, toxic gases or catalysts may escape in sufficient quantities to cause toxic effects through inhalation or skin contact, depending upon the chemical involved.

There are special problems connected with the diagnosis and treatment of these exposures which require knowledge in chemistry and toxicology of the substances involved. For example, treatment of a hydrofluoric acid burn is different from that of any other burn encountered in medical practice because of progressive penetration of the acid. The hydrous or the anhydrous form of acid may be involved. The hydrous burn frequently is a delayed reaction, whereas the anhydrous effects are immediate, and blanching is apparent. First aid is extremely important and depends upon the location of the burn and the degree of penetration. The less severe types can be treated by a copious flushing of water saline or ammonia-solution, followed by the application of a special salve containing magnesium oxide, glycerine, and magnesium sulphate. Oil base ointments or salves as wound coverings are contraindicated. Others with more penetration should be treated by removal of the superficial layer of the skin and this can be accomplished with sandpaper. Deeper burns, involving the corium, are treated either by infil-

tration with 10% calcium gluconate solution, by debridement, or more radical dissection of the tissues involved.

This type of occupational injury is only one of the special problems we meet in the oil industry. We have a large number of solvents or petroleum fractions with which the workman may come in contact, which can be highly irritating to the skin of susceptible individuals and cause industrial dermatitis or, with chronic exposure, hyperkeratotic lesions on face and hands. In this regard, supervision of personal hygiene is an important responsibility of the plant physician.

A good plant physician knows the processes and chemicals involved and is in a position to diagnose and treat special types of occupational exposures with which the employee comes into contact. He is therefore in a position to bring the employee the benefits of early diagnosis and treatment of occupational injuries and diseases.

Owing to the complexities of modern industrial processes a private practitioner may unwittingly become a party to an unwarranted claim of occupational disease or injury. Employees occasionally make a diagnosis of occupational diseases on hearsay. Relatively few employees know all of the specific occupational hazards in their working environment. I have seen instances where an employee, on the basis of hearsay, has influenced a family doctor to make an unreasonable diagnosis of hydrogen sulphide gas inhalation poisoning. In this case it was later proved that the employee did not work anywhere near the alleged exposure to gas, and that his symptoms were due to coronary disease. In these cases we welcome inquiry from the private physician and are happy to discuss all possible health hazards to help make a diagnosis. In this way, we frequently avoid embarrassment for the employee, the company, and the private physician.

Communications in the Field of Mental Hygiene

ANOTHER area of operation into which the industrial practitioner is being drawn is mental hygiene. We saw earlier that the employee whose wife threw dishes at him but missed is a potential emotional problem when he's on the job. He is also a potential accident and a potential source of poor morale and reduced job satisfaction to his fellow employees — or worse (if he be a supervisor) he may inflict his woes on his subordinates. Mental hygiene is becoming increasingly important to industry because of such potential losses. The industrial physician is frequently called upon by foremen and supervisors who see cases of employees showing evidence of emotional problems and reactions on the job. Counselling on emotional problems, both occupational and non-occupational, is not always feasible in a busy private office, and many of these cases are seen first in the industrial Medical Department. They do not necessarily call for a trained psychiatrist, but rather for a doctor who has been taught something of psychological and emotional reactions, who knows the temperament of the individual, the occupational situation, and who has time to talk to the individual. By spending some time listening to the employee, the industrial practitioner can frequently recognize home, family, and financial worries, as well as problems relating to other employees and supervision. In recognizing the interplay of these stresses we frequently are able to help an individual gain an understanding or insight into his behavior.

The good old ideal country doctor relationship consisted mainly in good two-way communications between the doctor and the patient. In a busy private office these communications may be difficult, especially in these days of over-specialization in medicine. Many industrial physicians are helping to hold this gateway of communication open. In so doing, industrial medicine has brought benefits to the medical profession at local and national levels. On the whole, it has done an informal but effective job of human and public relations wtih the working man or woman, organized or unorganized, during these crucial years when the balance might be tipped toward state control of medicine.

Communications on Labor Relations Problems

OCCASIONALLY the action taken by the Medical Department in issuing a notice of physical limitations becomes a labor relations matter. Most of such situations can be resolved amicably by frank discussion between the plant physician and union representatives. Such approaches to the Medical Department should be made through proper industrial relations channels. Occasionally medical evidence is presented from the employee's private physician, who examined the employee without the benefit of the clinical and laboratory information available to the industrial Medical Department. The union representative in helping the employee present his case will submit a statement from the private practitioner. Generally speaking, such statements are brief and contain an unqualified opinion to the effect that the employee can return to his usual work. The practitioner often is not familiar with the employee's usual work or may have a distorted opinion of it presented to him by the employee. In such instances it is important to explain to union representatives (with consent of the employees) the nature of the physical findings on record in the Medical Department and to indicate what procedures were necessary in arriving at these findings. The industrial physician should then communicate with the private practitioner. The medical ethics governing such a discussion are the same as between any two private practitioners. If an agreement cannot be reached on the diagnosis, the industrial Medical Department should be willing to have the employee given an examination by one of its specialists in the particular field of medicine involved. The plant physician should entertain a change of opinion in diagnosis as a result of further medical evidence. Once the

diagnosis is established, his opinion should be final in regard to the question of physical limitations as they relate to the job.

Summary

THE IMPORTANCE of teamwork between industrial physician and private practitioner has been discussed and it has been shown that they have interests in common in bringing healing benefits to the "whole man" and the community. The industrial physician counsels and guides employees on matters of health, and encourages them to seek prompt medical care when necessary from their private or family physician. In many instances, he is in a position to do this early enough to prevent disabling illness and economic loss.

The industrial physician can render valuable information and assistance to the family physician where there is a question of occupational factors affecting the health of a patient. These factors may relate either to placement following illness, emotional problems on the job, or more specific occupational hazards, such as toxic gases, fumes, dusts, or mists in the working environment. This assures early diagnosis, treatment, and the employee's return to productive work.

Through health education and counseling for emotional problems, the industrial physician at the plant assists in maintaining good communications between employees and the medical profession, and thereby strengthens public relations of the profession. Health practices on the part of employees are improved and there is a greater demand for medical services for themselves and their families. Private physician-patient relationships are strengthened.

There can be no question that benefits of a plant medical program go far beyond the walls of the plant, and these programs are making an ever-increasing contribution to the betterment of community health standards.

Time to Think

UNTIL better ways can be found it seems worth-while to us in the Bell System to take people off the job for long enough periods so that they will have time to listen, think, read and discuss — get into their minds a broader concept of what their job really is — and strengthen their talent to carry it out. Further it has seemed to us that the place to start is within the top management group itself — so that is where we are putting a good bit of our first effort. I want to say very humbly that we don't regard what we are doing as anything like an adequate answer to the questions I have been raising. We are just groping. We're in the first grade. But you have to make some kind of start if you want to learn anything and that's what we are trying to do. Our most substantial effort, in numbers of people, is what we call the Bell System Executive Conference. Every month a new group of 40 department heads from all sections of the country is meeting at Asbury Park, New Jersey, for a four-week conference. This has three objectives: to broaden thinking and outlook — to increase present effectiveness — and to stimulate interest in further self-development. We started this about 15 months ago and 700 key executives in our business will have participated by June of 1955. The men are generally in their late 40's and have been in the telephone business 25 years or more. A typical group will include a plant construction and maintenance head from Canada and an accounting manager from the Deep South; a man who has charge of all telephone business offices on Manhattan Island and another who heads the traffic forces in Wyoming. Along with these and other operating men there will usually be engineers, laboratory scientists, manufacturing superintendents, lawyers, a Medical Director, and a few other staff people. They live and eat and study together. Morning sessions are largely case problems, with guest speakers in the afternoon. Many of the speakers are from fields other than business. The group considers the ideas of economists, sociologists, psychologists, historians, and others. One will handle the economics and politics of the Federal budget, or perhaps farm price supports. Another will discuss minority groups and American business. We even have talks and discussions on international problems. In every instance the talks by guest speakers are preliminary to questions and free discussion. There is no teacher-to-pupil instruction in the usual sense; no preaching. There is no asking or advising the conferees to "think and act in the interest of the community." But does the give and take of minds help to broaden viewpoints? Does it stimulate new insights—give a man a better understanding of the relation between his job and the world around him? I can't help but think it does. And those who are taking part seem to think so too.

—From "Big Business and the Community," Address by CLEO F. CRAIG, President, American Telephone and Telegraph Company, at the Forty-Eighth Annual Meeting of the Life Insurance Association of America, New York, December 8, 1954.

Industrial Medical Association

President's Page

AS WE KNOW, one of the Industrial Medical Association's most important activities is expressed through the Occupational Health Institute. It is no hidden knowledge that the Institute has gone through a period of growing pains in the past year and a half—an experience not uncommon to newly established organizations. My firm belief, however, is that we have now passed through our "trial and error" stage and that the new OHI President and his cabinet are ready to proceed on a broader scale as an educational and public relations arm of occupational medicine.

I would like, as a matter of interest, and at the risk of being repetitious, to bring to attention again a few of the important areas of inter-relationships between the IMA and the OHI.

First of all, the President and President-Elect of IMA are automatically members *ex officio*, with full voting power, of the Board of Directors of OHI.

Second, the IMA Committee on Standards has the complete responsibility for establishing and maintaining in a current manner the standards of proper practice of medicine in industry upon which the OHI is guided in issuing certificates of approval to medical programs in industry. As may be imagined, this is inherently a "working committee," and, under the diligent leadership of DR. JIM HUGHES, is presently engaged in revising these standards and preparing a "manual for consultants" for our IMA district counselors, in addition to the usual committee work of reviewing and evaluating, with recommendations, the survey file of every unit applying to the OHI for recognition. The Committee, because of the very nature of its work, meets several times each year to consider individual cases that constitute special problems difficult to resolve in other ways, as well as to plan for the future. Like all others in IMA, the Committee on Standards will welcome suggestions and constructive criticism from our membership.

Third, IMA District Counselors, in addition to their many Association activities, make personal visitations to industries for the purpose of inspecting medical services applying to the OHI for accreditation. After completion of this work, a written report of the "on-the-spot" survey is made to the Committee on Standards for further handling and appraisal—"Approved" or "Deferred Approval." In this capacity, which is by no means a mandatory duty of the job, the Counselor is often referred to as the OHI "Regional Consultant."

Fourth, as stated in the OHI By-Laws, the OHI can be discontinued by a two-thirds vote of the Board of Directors of the IMA. I sincerely hope that those who desire more and detailed information regarding the relationships of the IMA and OHI will feel free to write DR. FRANK CALDERONE, Great Neck, Long Island, New York, the newly-elected President of OHI, or myself.

Kieffer Davis, M.D.

Association News

Northwest Association

W. DAGGETT NORWOOD, M.D., Manager, Health and Safety, General Electric Company, Hanford Atomic Products Operation, Richland, Washington, and IMA Director, sends an interesting description of the organizational meeting of the Northwest Association of Occupational Medicine. Having arrived too late for the details to be included in this section, they will be found under "Personal News" on page 14.

New Members

THE following members of the Sociedad Cubana de Medicina del Trabajo, Habana, Cuba, have been approved for direct Active membership in the Industrial Medical Association: CESAR CABRERA CALDERIN, M.D., Professor of Anatomy, Habana University, Director of "Clinica Operacion," private hospital; ROGELIO DE CARRERA DE LA TORRE, M.D., Cardiology, various insurance companies; FRANCISCO CARRUANA SANCHEZ, M.D., Medical Director, Procter and Gamble; JAUN CHAVEZ GONZALES, M.D., Compania Rayonera Cubana; BENITO DURAN CASTILLO, M.D., Ministry of Labor; ANTONIO J. FERNANDEZ MENENDEZ, M.D., Medical Director, Tabacalera Cubana; EMILIO GARCIA FERNANDEZ ROCES, M.D., Forensic Medicine, various insurance companies; MANUEL GARCIA GONZALEZ, M.D., Chief Surgeon, "Nuestra Senora del Pilar" private hospital; insurance companies; ALFREDO GONZALEZ GARCIA, M.D., Medical Director, "Retiro Azucarero"; FRANCISCO LANCIS SANCHEZ, M.D., Professor of Toxicology, Habana University, Medical Director, "La Federal," insurance company; ALFREDO LOPETEGUI SANCHEZ, M.D., Medical Director, "Siboney" Insurance Company; JESUS LOPEZ LUIS, M.D., Medical Director, Compania Rayonera Cubana; OSWALDO MORALES PATINO, M.D., Ministry of Labor; PEDRO NOGUEIRA, M.D., Cerveceria "La Tropical"; ANGEL V. SUAREZ SIMON, M.D., Medical Director, "Cuba Industrial y Comercial"; LEOPOLDO DIAZ DE VILLEGAS d'ESTRAMPES, M.D., Medical Director, "La Tabacalera" Insurance Company; JOSE ANTONIO BRYON CAGIGAS, M.D., Director de Cursos sobre Medicina del Trabajo en la Universidad de la Habana, Universidad de Oriente, Cuba, y Universidad de Santo Domingo, Republica Dominicana.

Previous IMA Active Members of this Industrial Medical Society of Cuba are DRS. TOMAS ARAMBURU, Medical Director, Esso Standard Oil; MARCELO DE CATURLA, Ministry of Labor; ALBERTO SUAREZ URGELLES, "La Alianza" Insurance Company; and RAFAEL PENALVER BALLINA, Medical Director, Autobuses Modernos. Application for membership has also been received from DR. JOSE PRATS GARCIA, Medical Director, Cooperativa de Seguros Aliados del Transporte.

Other Active Members approved as of July 28 are: DR. REMI AUBE, Alma, Province of Quebec; DR. CHARLOTTE MABREY BEESON, Albuquerque, New Mexico; DR. RICHARD W. BUNN, Winston-Salem, North Carolina; DR. E. B. CUNNINGHAM, Bristol, Tennessee; DR. J. N. DUDLEY, Albuquerque, New Mexico; DR. P. C. FUNK, Dallas, Texas; DR. O. D. GROSHART, Chattanooga, Tennessee; DR. F. FLORES OLLOQUI, Monterrey, N. L., Mexico; DR. C. G. PREECE, Edmonton, Province of Alberta; DR. HARRY D. RIDDLE, Gastonia, North Carolina; DR. J. S. SMITH, Westmount, Province of Quebec; DR. BURTON M. ZIMMERMANN, Warrington, Florida.

Approved for Associate Membership were DR. G. WILSON CULLUM, Dhahran, Saudi, Arabia; DR. RALPH W. HUBBARD, Oklahoma City, Oklahoma; DR. WILLIAM J. JOHNSTON, New Orleans; and DR. C. S. PLUMB, Pisgah Forest, North Carolina. And changed from Associate to Active Membership were DRS. SYDNEY M. KATZ, Brooklyn, New York, and SAUL SOLOMON, New York City.

In addition to these new members, some 75 have been approved through the Component Societies since the Annual Meeting at Buffalo in April.

Books

"Not Over Eight of Us"

ACOUSTICS: LEO L. BERANEK. McGraw-Hill Book Company, New York City, 1954, pp. 481, $9.00.

Well it is known that DR. BERANEK can write and has written helpfully and constructively for physicians about noise and sound. Equally well known is that DR. BERANEK can write and has written engagingly for laymen to their profit. This time in this esoteric book he lays aside all simplicity and writes pontifically for astute students about the new era in acoustics—the era of precision engineering. In time these exceptional students will carry the newer acoustic understanding into music, architecture, engineering, science, drama, medicine, psychology, and linguistics. In the beginning the simplicity of the chapter headings is seductively disarming. Some of these are: "The Wave Equation and Solutions," "Radiation of Sound," "Acoustic Components," "Microphones," "Direct-Radiator Loudspeakers," "Loudspeaker Enclosures," "Horn Loudspeakers," "Sound in Enclosures," "Noise Control," "Acoustic Measurements," and "Hearing, Speech Intelligibility, and Psychoacoustic Criteria." Then comes the devastating unfoldment. Twenty-five years ago it was said in meek non-understanding of Einstein's pronouncements that not over eight scientists the world over fully grasped their implications. Now of those eight super-intellectuals, perhaps three (the others not having taken the BERANEK course) might label this book as elemental. Thus on page 41 a representative situation appears:

"The instantaneous energy density for such a wave in the steady state is

$$D(x,t) = |p^+|^2 \left(\frac{Po}{Po^2C^2} + \frac{1}{PoC^2} \right) \cos^2[K(ct-x)+\theta]$$

$$= \frac{2|p^+|^2}{PoC^2} \cdot \frac{1+\cos 2\omega(t-x/c+\theta/\omega)}{2}$$

$$= \frac{|p^+|^2}{PoC^2} [1+\cos 2\omega(t-x/c+\theta/\omega)] \qquad (2.72)$$

"This equation says that for a plane free-progressive wave, at all times, the kinetic and potential energy densities are equal at a given point in space but that they vary with position or with time sinusoidally from zero to twice their average value."

It is conceded that this equation says just that but to this reviewer the decibel level of its saying is but the gentle murmur of the swaying of a small wheat field on a still day.

In humility this book is awarded the accolade of "ex cathedra," but in consternation is the admission that the effort to comprehend involves the processes

of excarnification. This is the final lecture on acoustics.

Heaven Forbid A Sequel

ORGANIC CHEMISTRY SIMPLIFIED (Second Edition): R. MACY. The Chemical Publishing Company, Inc., New York City, 1955, pp. 611, $12.00.

Perforce, most industrial physicians must possess greater capacity as to chemistry than the average physician in general practice. Some few industrial physicians serving in the chemical field and those allied, such as the petroleum industry, could qualify as chemists and their services within their own bailiwicks become more valuable thereby. Ordinarily, physicians move about fairly freely in inorganic chemistry, less well in biological chemistry, but when it comes to organic chemistry, they reel and stagger. The author, in this second edition as well as the first, patiently goes about the paving of the way for physicians and others little schooled in organic chemistry, through elemental considerations as to atoms, molecules, electrons, valence, the elements, periodic systems and much such. Having well grounded his scholars, the author moves then into the complexities of carbon chains, carbon rings, benzene rings, paraffins, olefins, acetylenes, aldehydes, ketones, nitrogen compounds, heterocycle agents, carbohydrates, dyes, etc. In time that word "simplified" is forgotten. This author flatters most industrial physicians. Earnest as his efforts are to keep the training simple, these many complexities could lead to confusion. Still, if the industrial physician be well determined to add to his status re organic chemistry, this is the text for self-education, but the going will not prove easy. Heaven forbid that this author, as a sequel, should turn out a text entitled "Organic Chemistry Unsimplified"—at least not for industrial physicians.

Second Conference on Tropical Health

INDUSTRY AND TROPICAL HEALTH II: THE HARVARD SCHOOL OF PUBLIC HEALTH. Robert W. Kelly Publishing Corporation, New York City, 1955, pp. 266, $10.00 (Professional Rate $5.00).

In the June, 1952, issue of this Journal, a review of the Proceedings of the First Conference of the Industrial Council for Tropical Health was presented. This second lot of proceedings bears close resemblance to the first but on a larger scale, with more participants and with evidence of increasing awareness that occupational health is global and that the stake of the industries of the United States is enormous.

The listing alone of the participating industries by implication suggests that every major corporation of this country has outposts in many near and far overseas and adjoining countries. One striking feature of this volume is the emphasis directed to those diseases scarcely occupational in nature in this country that unequivocally become occupational in tropical locale. Malaria may be utilized as the perfect example.

Out of the 46 papers that constituted the three-day session, a few titles have been selected to reveal the flavor of these programs: "Education of Physicians for Industrial Tropical Operations," "Human Performance in Excessive Heat," "Habits, Rituals, and Religions," "Medical Needs of Industry Abroad," "Economic Aspects of Medical Care in the Tropics."

Many records of proceedings are shabby in appearance, often only mimeographed and badly bound. These present proceedings are otherwise. They are beautifully printed, illustrated, and bound. The register of the Second Conference provides brief vitas of all speakers together with their photographs.

Lately there have been a few grevious complaints made by physicians who have gone about overseas assignments in occupational health. Without assaying the merits of these complaints, let it be said that this volume portrays occupational health as it should be in lands foreign to the United States and the good of occupational health as it actually is conducted in many overseas locations.

The Vicissitudes of Medical Practice

HANDBOOK OF MEDICAL TREATMENT (Fourth Edition): MILTON J. CHATTON, SHELDON MARGEN, and HENRY D. BRAINERD, Editors. Lange Medical Publications, Los Altos, California, 1954, pp. 569, $3.00.

Some physicians are so busy, so preoccupied, so harried that they have little time for the deliberate pursuit of newness in medicine, new theories, new therapies. These physicians without opportunity to sit complacently in the inglenook demand that everything medical be condensed, appraised and handed down by others and even although they will not admit it, that much of their thinking be done for them. This Journal long an exponent of reading the fullness of originals, is never adamant in that purpose. That being true, every willingness exists to record that of medical handbooks on treatment here is one in pocket size that contains nearly everything and without an inch of wasted space. Even the inside cover provides technical information with its edge devoted to a metric system scale, with the inside back cover providing a similar scale in inches.

Going about the business of testing the contents of this book for newness, search was made and was successful—the newness: the treatment of lead poisoning with versenes, a highly new development in occupational disease therapy. Sure enough, condensed mention is provided with the inclusion of something that some writers of brochures in longer form fail to include, i.e., the exact procedure: "Dosage varies; 300-600 cc. (10-20 oz.) 5% solution over a 2-hour period I.V. daily for 5-10 days."

If the vicissitudes of medical practice demand handbooks, the chosen handbooks must be reliable and full in coverage within its territory. This is such a handbook.

The Other Extreme

PHARMACOLOGY IN MEDICINE: A COLLABORATIVE TEXTBOOK: VICTOR A. DRILL, Editor. McGraw-Hill Book Company, Inc., New York, 1954, pp. 1208, $19.50.

For review purposes, this massive book is paired with another just preceding. That other one is a handbook on therapy fully condensed and by design incomplete except within its own purposes. The present one several times the size of the other, is elaborate, somewhat exhaustive, and of a format calling for desk or library usage and is exactly the opposite of a handbook. Each has its place. Medical students detest multi-lecturers in a single course. At each period a new orientation is required, new adjustments to mannerisms, organization of data, etc. Not so in the case of a collaborative textbook where every contributor is an authority and where every new chapter is an entity. So it is with this text. Eighty-one authors joined in the enterprise. To provide some indication of the elaborateness of coverage, reference may be made to the first major topic covered, "anesthetics." Under that heading, 15 subsections were devised embracing such items as

"Theories of Anesthesia," "Transport of Anesthetics and Stages of Anesthesia," "General Anesthesia," "Local Anesthesia," "Respiratory Reflexes during Anesthesia," "Preanesthetic Medication," "Basal Anesthetics," "Sedatives and Hypnotics," "Narcotic Analgesics," "Nonnarcotic Analgesics and Antipyretics." Could coverage readily be any more extensive?

The field of pharmacology and therapeutics advances rapidly, and each year new and better drugs are made available for the treatment of disease. Pharmacology, covering a wide field, interrelates with all phases of medicine, so that the progress becomes at times overwhelming. To keep abreast of these changes, many of the disciplines of medicine have, of necessity, gravitated toward multi-authored presentations of their field. Such is the present "Pharmacology in Medicine."

On Occupational Lung Diseases

KLINISCH-ROENTGENOLOGISCHE DIFFERENTIALDIAGNOSTIK DER LUNGENERKRANKUNGEN (Clinical-Radiological Differential Diagnosis of Lung Diseases): LASAR DUNNER. Published by Ferdinand Enke, Stuttgart, Germany, Price 49 Mark.

It is appropriate to review this textbook on differential diagnosis of lung diseases in this periodical, as it deals to a rather large extent with occupational lung diseases, the pneumoconioses and their different manifestations. As a rule, textbooks on lung diseases written by chest physicians, if they include pneumoconioses at all do so only in perfunctory fashion. It is not a surprise that this book's author is an exception.

DUNNER is known for many papers on occupational lung diseases during the last 12 years. This present book has been written in a clear and didactic style. He proves to be the physician and radiologist in one person with an exceptionally wide clinical experience. The principal part of the book is devoted to radiology. It contains 318 x-ray photographs. DUNNER reveals to the reader again and again the limits of both clinical and radiological findings in reliable diagnoses. Doing so he differs from some others who think that a diagnosis always can be made. Thus in the chapter on chronic diseases with radiological miliary pattern, the author warns not to diagnose miliary tuberculosis on first sight, but to exclude other conditions among them the pneumoconioses. He discusses this problem in detail and brings impressive x-rays of snowstorm pneumoconioses. In the same chapter there is also a case of what he calls localized miliary pneumoconiosis. In a similar way, he deals with well-defined round foci being manifestations of pneumoconiosis.

The make-up of the book is beautiful and the reproductions of the x-ray films are excellent. This is the book anybody should possess and consult who has to deal with lung diseases. One must hope it will be translated into English for physicians who do not command the German language.

A Titan

THE HALOGENATED HYDROCARBONS TOXICITY AND POTENTIAL DANGERS: W. F. VON OETTINGEN, U. S. Department of Health, Education and Welfare, U. S. Government Printing Office, Washington, 1955, pp. 430, $2.50.

Repeatedly it is astonishing to the elders in occupational health that so many advances have been made that it becomes proper and necessary to devote entire and large volumes to a single chemical or to a single small group of chemicals. Thirty-five years ago, the most optimistic of the small number of industrial hygienists in and out of medicine could not have foreseen that in the year 1955 a 434-page book would be devoted exclusively to the Halogenated Aliphatic Hydrocarbons. This book, in hand, furnishes ample proof of the growth of occupational health.

At just about the mid-point within this 35-year period, there is a station along the way as to halogenated hydrocarbons found in a much smaller, but then essentially complete, review as of 1937. Compared to that publication, the present one is a titan.

These 434 pages are devoted to the chemistry, analytical procedures, present and potential uses, investigative toxicology, clinical toxicology and the diagnosis and treatment of poisoning attributable to these hydrocarbons. The book is exact, comprehensive and authoritative. All of that becomes a certainty since the author is W. F. VON OETTINGEN.

Absinthe to Zirconium

CLINICAL TOXICOLOGY: C. H. THIENES and T. J. HALEY. Lea & Febiger, Philadelphia, 1955, pp. 457, $6.50.

So engrossed are industrial physicians and industrial hygienists in industrial intoxicants that they may overlook the obvious fact that many scores of other intoxicants are unrelated to industrial pursuits. This book serves as a reminder to the contrary. It provides a highly condensed coverage for all manner of intoxicants from absinthe to zirconium, mentioning but not over-emphasizing industry's own trouble-makers.

In this third edition the newness encountered embraces "the chlorinated hydrocarbon and organic phosphate insecticides, antihistamines, antabuse, beryllium, iron, sulfur dioxide, formaldehyde, fluoroacetate, the new curariform drugs, ganglionic and autonomic depressants, cortisone, and many others. Tests for alkaloids have been extended and rewritten. Spectrophotometric tests for the barbiturates have been added, and the suggested maximum safe concentrations of many industrial poisons in air are listed for most air pollutants. In every respect, this is an essential guide for general practitioners in private and industrial practice, surgeons, clinical pathologists, hygienists, anesthesiologists, and clinical and industrial chemists."

Letters

Dry in the Shower

TO THE EDITOR: I do considerable foundry industrial medicine in Rockford and in the course of such work I see a great many minor burns about the foot and ankle necessitating dressings, yet these firms do not all have nurses on duty and when the workers take their showers after work, the dressings are ruined, so that the matter presents quite a problem.

Recently I purchased some vinyl plastic turkey size bags and issued them to these men, with a wide rubber band. They can slip the bag over their pressure vaseline dressings and take their shower and keep the affected part dry. I pass this on for what it is worth, as maybe someone else might have this problem and could use the suggestion.

—STANLEY E. ANDERSON, M.D.
1632 Broadway, Rockford, Illinois.

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"Things" and Intangibles in the Life of the Industrial Worker

IN THE July issue, this Journal provided some comment on the Lake Logan Conference on Occupational Health. A high point there was that industrial management is placing too great a reliance on "things" in seeking rapport with industrial workers. At a subsequent conference, the Silver Bay Conference on Human Relations in Industry, that same emphasis crept in without any known overlapping of speakers or program items of the two conferences. Thomas G. Spates, Professor Emeritus of Personnel Administration at Yale University, minced no words in his keynote presentation. Among many other items, the following stand out as salient:

"Collaboration of labor and management on material objectives has brought highest real wages in country's history but has failed to bring both sides any closer to industrial harmony. Past few years of unprecedented prosperity for American workers have seen 'a whole series of uniquely unfavorable events in labor-management relations.' Industry has permitted its strategy to be dictated by labor. By accepting labor's emphasis on material objectives, on tangible easily measured gains, industry has, by and large, tended to neglect qualitative, spiritual factors essential to genuine job satisfaction and hence high morale.

"Management must concentrate on things unions do not demand, continuing to support high living standards for workers but within a framework of values that will provide new dimension of satisfaction. Management must:

"Emphasize freedom of opportunity which unions have dropped in their insistence on union shop and straight seniority.

"Heighten urge to greater productivity, higher quality of workmanship and show their relations to improved living standards and to workers' own dignity and self-respect. Slogan should be 'more and more for more and better work,' rather than 'more and more for less and less,' which weakens workers' self-respect and sense of genuine accomplishment.

"Demand that individual be focal point in efforts of both unions and management. Specify problems of workers as individuals, while unions press for uniform levels of treatment and mass conformity. Help in personality growth of each person on payroll.

"Communicate with employees directly and not through union, and talk to all employees on equal terms, whether or not they are union members.

"Administer by consultation and explanation, so that communication between employees and management moves freely in both directions.

"Provide employees with explicit statement of company's philosophy of personnel relations and detailed explanation of company policies. Put these into daily practice and maintain them courageously in every situation.

"Conduct periodic inventory of its management personnel to see how well they live up to code in practice.

SPIRITUAL factors introduced by management in its personnel administration will give American industrial life a critical edge over that of the U.S.S.R. in eyes of workers, as Russia rapidly becomes this country's most serious industrial competitor.

Hopeful signs that American industry is making up for past mistakes were offered. "Manage-

ment is going to school in ever-increasing numbers to acquire more knowledge and skills in personnel administration. More top level executives acknowledge that personnel administration requires special training and special talents. Where companies have given their employees explicit detailed accounts of their policies—and lived up to them—they have had impressive records of labor peace. A growing tendency is to select supervisors for leadership and moral qualities, rather than for skill alone. Economic training programs demonstrated that, when workers were treated seriously by management, when their opinions were obviously considered important, there was noticeable heightening of morale."

A little sorrowfully and reluctantly, management is admitting that in large measure it has lost the hearing ears of its workers. Maybe, after all, the worker is not so deaf to management as he sometimes appears. Maybe right now he has both ears cocked in the direction of management and hopefully is listening. There are but few workers who have no aspiration beyond higher and higher wages with fewer and fewer hours of labor. Their yearnings for the intangible values cannot always be satisfied with "things."

Tobacco and Cancer

MANY scores of journals in and out of medicine during the past two years have found usable copy within the controversy "Tobacco and Carcinogenesis." That fruitful source of attention-attracting material may not have run its course but here and there are signs of the beginnings of the counterpart—the "T'ain't So" reports.

Unofficial extracts from the official report of the British Empire Cancer Campaign contain these items: "Experiments to test the carcinogenicity of artificially-produced tar from cigarette smoke, which were started at Leeds in 1953, and reported last year, have been continued. Two preparations have been tested, in five strains of mice over 18 months, with a completely negative result to date. This suggests at most that any carcinogenic properties possessed by the tars used are very attenuated. In view of their importance, these experiments are being repeated and extended.

"In other experiments in which mice have been exposed for long periods of their lives to cigarette smoke, the induction of lung cancer has not been observed. This may, however, simply be due to the unsuitability of this particular species. Accordingly other species, and especially the hamster, are being tested by similar means. Condensates from cigarette tobacco smoke, and from cigarette paper smoke, have also been examined for the presence of carcinogenic hydrocarbons and, in particular, 3:4-benzpyrene. In the case of the smoke condensate from cigarettes made of cigarette paper, examination of a large series of fractions has led to the detection of the latter hydrocarbon.

"At another centre, extracts have been examined of used cigarette filters and of paper-filled cigarettes. The similarity of the products from cigarettes and cigarette paper, which in both cases include 3:4-benzpyrene, suggests that they are derived largely from cellulose, and from related compounds in the tobacco plant.

"Experiments to test the carcinogenic action of tar obtained from mechanically-smoked cigarettes administered over prolonged periods by feeding and by direct injection into the lungs of mice, as also of tobacco tars produced under conditions as nearly as possible resembling those in ordinary smoking, have proved negative.

"Cigarette tobacco extracts obtained from the butts of naturally smoked cigarettes have also proved inactive in tests for carcinogenic initiating and promoting action."

Equal Beside Equal

MOST of what DR. LUONGO says in his lecture on relationships between industrial medical and general practice (page 459) has been said before—much of it by him in this Journal. But all of it bears repeating; both parties to the relationship will profit from hearing it again and often, until they fully appreciate its numerous implications. Among the wisdoms implicit in the text is the taken-for-granted recognition of the clearing atmosphere in which the relationship exists. The smog so lately composed of smugness and intolerance on the part of the general practitioner and defensiveness on the part of the industrial medical man has been dissipated to such an extent that each now can have clear sight of the other. And with seeing comes knowing—and that is the path to understanding. As both travel that path, they will go along together in the relationship of equal beside equal. In the company of companionship thus at parity, it is probable that the general practitioner will ultimately acknowledge the place of preventive medicine in his individual practice. When he gets that far he really will be doing the large proportion of industrial medical work for which, on the basis of having a few patients in overalls, he has been getting so much credit.

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To initiate the normal defecation reflex, the "smoothage" and bulk of Metamucil provide the needed gentle rectal distention.

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Rectal distention is a vital factor in initiating the normal defecation reflex, and sufficient bulk is thus of obvious importance in restoring this reflex. Metamucil provides this bulk in the form of a smooth, nonirritating, soft, hydrophilic colloid which gently distends the rectum and initiates the desire to evacuate. Metamucil demands extra fluid, imparting even greater smoothage to the intestinal contents.

It is indicated in chronic constipation of various types—including distal colon stasis of the "irritable colon" syndrome, the atonic colon following abdominal operations, repressions of defecation after anorectal surgery and in special conditions such as the management of a permanent ileostomy. Metamucil is the highly refined mucilloid of Plantago ovata (50%), a seed of the psyllium group, combined with dextrose (50%) as a dispersing agent.

The average adult dose is one rounded teaspoonful of Metamucil powder in a glass of cool water, milk or fruit juice, followed by an additional glass of fluid if indicated.

Metamucil is supplied in containers of 4, 8 and 16 ounces. G. D. Searle & Co., Research in the Service of Medicine.

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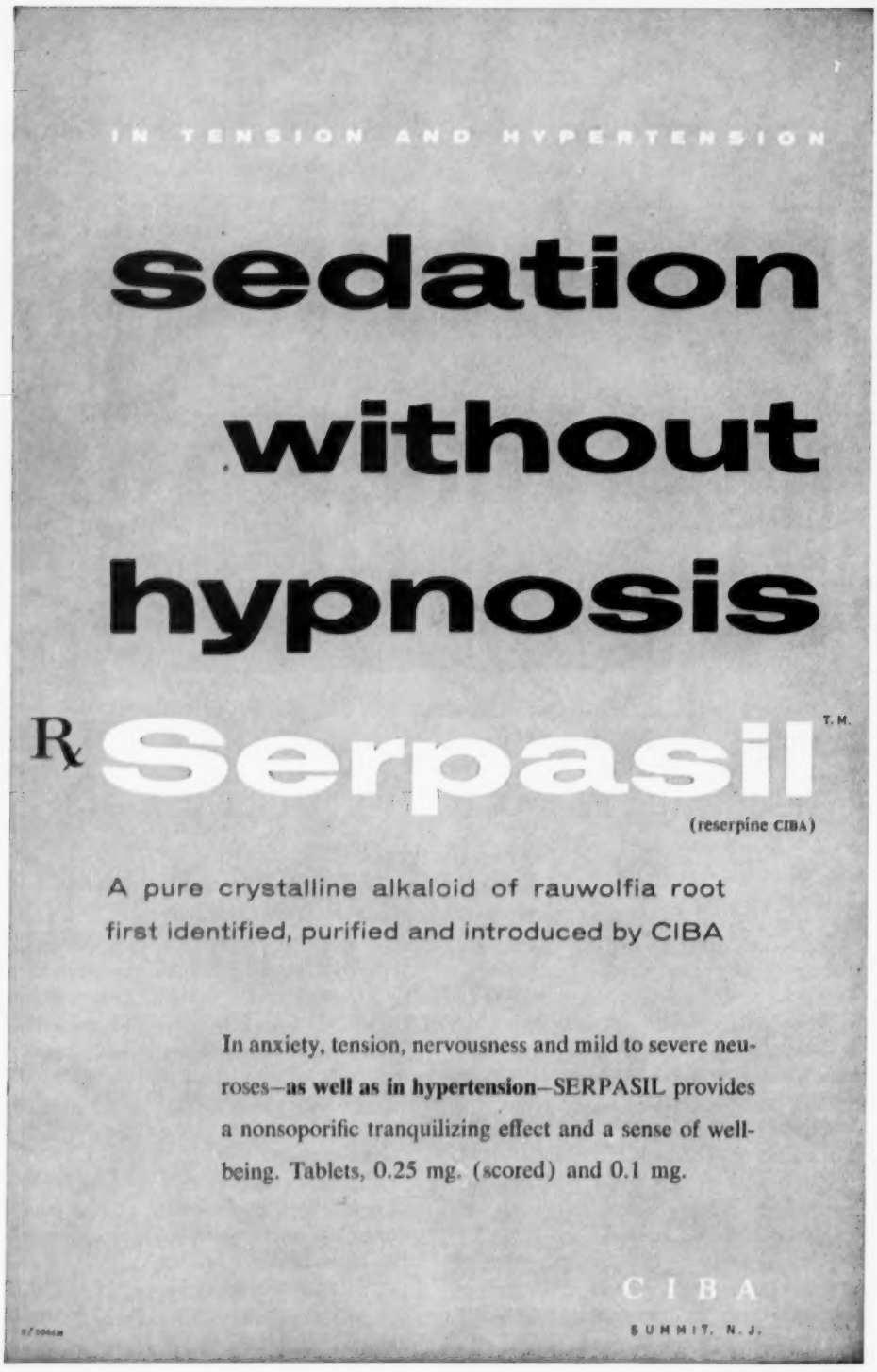
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1. Overall, J. C.: Southern M. J. 47:789, 1954. 2. Editorial: New England J. M. 246:111, 1952.
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PREPARATION H®... containing new healing substance, (Bio-Dyne®) – discovery of a world-famous research institute, is effective in the reduction of external and internal Hemorrhoids. PREPARATION H relieves the accompanying pain and discomfort – clinical records show that healing takes place in a short period of time. Packaged in 1 oz. tubes with applicator. $8.80 per dozen tubes.

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You can solve a good proportion of it among your workers with this scientific tool, the

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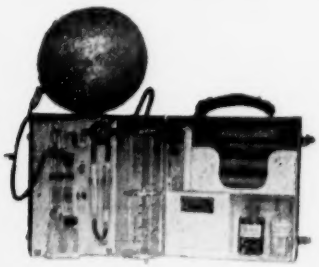

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It protects the light drinker and convicts the guilty.

Checks feigned illness, accident possibility, reduces production costs.

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News, Comment, Opinion

MORE industrial workers hurt and killed off job than on, according to all-safety issue of employee magazine at American Brake Shoe Company, New York, which points out that last year more than 44% of all accidents occurred at home, 33% on highway, only 20% on job. Company credits low rate of industrial accidents to concentrated safety programs practiced by most industries; cites own record: On-job injuries reduced by 63% in last five years in its 58 plants employing over 8,000 workers. Company spends about $750,000 yearly on employee health and safety.

—*Industrial Relations News*, September 3, 1955.

Cancer Testing

YOUNGSTOWN Hospital Association early in August conducted a cancer testing program. Among the subjects were about 3,000 workers of Youngstown Sheet and Tube Company.

—From *Youngstown, Ohio, Vindicator*, August 9, 1955.

Costly Third

COSTLY THIRD accounts for 75% of absenteeism costs at A. C. Nielsen Company, Chicago. In 1954, company study revealed absenteeism average of 15½ days yearly per employee (as compared with that of other leading Chicago companies: 10 days yearly). Follow-up study, year later, shows drop to 12¾ days per employee. However, analysis of department records shows all departments have "costly third" which takes off 5½ times as many days as other two-thirds, missing average of 20 days yearly, as compared with 3½ days for other two-thirds, and which accounts for about $75,000 of company's $100,000 yearly bill for absenteeism.

—*Industrial Relations News*, August 13, 1955.

Health Course

ATLANTA Division, University of Georgia, is conducting a course in Occupational Health for industrial nurses, prospective industrial nurses, nurse educators, and others interested, October 3-14, 1955. MRS. ELEANOR BAILEY, Occupational Health Consultant Nurse, Division of Special Health Services, Public Health Service, Department of Health, Education and Welfare, Washington, D.C., will be the Instructor. Further information may

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Medical Director: (b) M.D., Stanford; Bd elig in surg, 3 yrs. priv pract, med & surg; 6 yrs. officer, USAMC, (overseas) 6 yrs. Med Dir. impor indus facility; since 1953, Dean, Univ Schl of Med; seeks better locality for children; wishes return to industrial medicine; middle 40's.

Medical Director: (c) Diplomate, American Board, Preventive Medicine & Public Health; 10 yrs. Dean & prof of med, several very impor univ med schools; now pref indus med or indus hygiene; extremely competent, and superior man; seeks larger cities, any locality; recommended.

Assistant Medical Director: (d) Certified, preventive med, '52; 3 yrs. indus phy, State dept of hlth; since '54, Plant Med Dir, one of America's largest chemical companies, will consider directorship, small Co; pref New England or North Atlantic States; 41.

Assistant or Medical Director: (e) 38; M.D. Jefferson, Phil; 1 year priv gen'l pract; 1 year, R.R. med examiner; past 7 years, plant phy, semi-heavy metal fabricating indus; exceptionally well exper'd indus phy able to set up or assist indus medical program.

Staff: (f) M.D., Med Evangilists; 6 yrs. priv gen'l pract; 1 yr, indus surg, 3 yrs. residency, gen'l & traumatic surg; past 2 yrs. priv pract med & surg; prefers indus med; Ind, Mich, Calif; age 38.

Staff: (g) MD, Jefferson; excel res, medicine; past 4 years, successful priv gen'l pract; desires indus med with regular hours; prefers warm climate; inter'd Ariz, Calif, Nevada, Florida; age 31.

Staff: (h) 30; MD, Temple; yrs internship; 2 yrs. med officer, USNMC; 1 yr, indus phy, arsenal program; 2 yrs, staff phy, semi-heavy metal fabricating Co; prefers East.

SITUATIONS OPEN

Medical Director: (a) regional plant of impor Co; one of leaders in its field; excel oppor advance to higher level within this organ hav'g program of expand'g medical facilities; Midw.

Medical Director: (b) Career post; regional plant major company; outstand'g potential; 2 openings; Mich & Ohio.

Medical Director: (c) New post; full time; impor plant of company, largest in its field; will replace part time man; 6000 empl; lge city on West Coast, excel salary.

Medical Director: (d) Replace dir recently deceased; plant, 2000 employees; excel prog; attractive town 15,000 nr St. Louis.

Medical Director: (e) Plant expansion now requires full time med dir; 2500 empl; heavy industry; excel prog; numerous benefits; city 200,000; substantial sal will be negotiated; New England.

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ORIGINAL SPRAY TOPICAL ANESTHETIC

Stops pain in minutes, relieves for hours, minimizes shock. Quick, painless, sanitary application. Contains 20% dissolved benzocaine, most potent, least toxic of topical anesthetics. In bland, water-soluble vehicle. Use also for pre-debridement of abrasions, etc.

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be obtained from the Department of Nursing, Atlanta Division University of Georgia.

Harder on the Heart

ACTUALLY, the idea that physical work, especially hard physical work, is bad for a man's heart is entirely erroneous. There is ample statistical proof that this is true only if coronary degeneration has progressed to an advanced stage. As a matter of statistical and medical fact, physical activity, even substantial, hard, physical work, is man's healthiest course. Studies show that men 45 to 64 years old doing heavy work are only 50% as likely to die from coronary-artery disease as those doing light work! In almost all cases, idleness is harder on the heart than a job.

—From "Placing the Partially Disabled Worker a Growing Management Problem," by STANWOOD L. HANSON, in *Supervision*, July, 1955, quoted in *Management Review*, September, 1955.

Los Angeles

THE APPLICATION of the Principles of Industrial Medicine to Private Practice," a course open to qualified physicians and to industrial nurses, industrial hygienists, attorneys, claims adjusters and others will begin at the University of California Medical Center in Los Angeles, Wednesday, October 19, and continue through December 14. All meetings are scheduled for Wednesdays from 7:30 P.M. to 9:30 P.M. Fee for the University Extension Class, which is sponsored by the University's Medical School, is $40. A spring program in the study is scheduled to start February 1. Application or requests for information should be made to THOMAS

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Reprints Available

INDUSTRIAL Hygiene Foundation has available reprints of two articles by THEODORE F. HATCH, as follows: "Proposed Program in Ergonomics—Human Engineering," reprinted from the *Mechanical Engineering* for May, 1955; and "Developments in the Sampling of Air-Borne Dust," reprinted from *A.M.A. Archives of Industrial Health* for March, 1955.

To the Hospital

PROCEDURE for transporting injured employees to hospital is usually clearly defined in most plants, large and small, according to survey recently made by Associated Industries of Cleveland. Following is general practice: Employee is taken to hospital in company car, if he is not stretcher case. Company station wagon, if equipped with stretcher, is used when employee is more seriously injured, or ambulance is called. If employee car is used, employee-driver receives rate and mileage at from six cents to nine cents per mile. In many companies responsibility for accompanying injured to hospital is assigned to definite personnel—guard, supervisor, foreman, personnel department, nurses, or member of safety department.

—*Industrial Relations News*, August 6, 1955.

Rehabilitation

A NEW concept in the handling of paraplegics and a new philosophy of medical care involving comprehensive treatment of the patient until he is fully restored to society and back

you get... specific control of the hyperactive cough reflex — without undesirable opiate side effects

with new, non-narcotic, non-opiate

TOCLASE*

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Available as: TOCLASE EXPECTORANT COMPOUND (sugar free, cherry flavored, amber color) bottles of 1 pint; TOCLASE SYRUP (cherry flavored, red color) bottles of 1 pint; TOCLASE TABLETS 25 mg., bottles of 25.

*Trademark

Pfizer PFIZER LABORATORIES, *Division, Chas. Pfizer & Co., Inc.*, Brooklyn 6, N. Y.

to work are being pioneered in Boston. The Liberty Mutual Insurance Company is setting up an industrial rehabilitation department and neurosurgical service for paraplegics in the Haynes Memorial Department of the Massachusetts Memorial Hospitals in cooperation with the Boston University School of Medicine. A 26-bed paraplegic unit equipped with all the facilities is being constructed at the hospital. The school and the hospital will set up a model teaching clinic. Chief of the new service is DONALD MUNRO, M.D., present chief of neurological services, Boston City Hospital. Liberty Mutual, one of the country's largest compensation carriers, began rehabilitation service for paraplegia in 1945. It has undertaken rehabilitation on 64 cases and completed work on 49, of whom 25 have returned to work. It is estimated that the net saving through rehabilitation of the 49 will prove to be considerably more than one and three-quarter million dollars.

—*Am. J. Pub. Health*, June, 1955.

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to successful therapy . . .

for *Contact Dermatitis*

- **Contact Dermatitis** IS THE MOST FREQUENTLY ENCOUNTERED OF ALL DERMATOLOGICAL DISORDERS.
- THE OBJECT OF THERAPY IS TO SOOTHE AN ALREADY IRRITATED SKIN. DO NOT OVERTREAT.
- THERE ARE NO CUTANEOUS CONTRAINDICATIONS TO BATHS, SOAKS OR WET DRESSINGS. MAKE USE OF THEM.
- AVOID GREASY PREPARATIONS (SALVES) ON ACUTELY INFLAMED OR EXUDATIVE AREAS.

REDUCE ABSENTEEISM
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Noise

THE SIXTH Annual National Noise Abatement Symposium will be held Thursday and Friday, October 20 and 21, at Armour Research Foundation of Illinois Institute of Technology, Chicago. The three sessions will include: (1) Noise in Industry (Case Histories)—Description of the problem; what was done to solve it; the results. (2) Impact Noises—Practical reduction of impact noises; instrumentation for the measurement and analysis; of such noises. (3) Novel Methods of Noise Reduction—A series of papers on situations where noise reduction was obtained without the use of the usual acoustical materials.

Warning: Poison

POINTING out that Margo Jones, Broadway and Dallas theatrical producer and director, died recently from uremic poisoning caused by carbon tetrachloride fumes in a cleaner, the National Institute of Rug Cleaning warns: Don't use rug cleaners containing carbon tet. There are some on the market, and they're dangerous. Carbon tetrachloride is highly effective as a soil remover, but it's also effective as a killer. In contact with the hands it can cause dermatitis. It may be absorbed through the skin into the blood stream. It may affect organic tissues. The American Conference of Governmental Industrial Hygienists gives the maximum allowable concentration for an eight-hour exposure as 25 parts of carbon tetrachloride vapor per million parts of air. With chloroform it's 100 parts per million.

—*From New York Retailing Daily*, September, 1955.

Agricultural Medicine

IF pigs were subject to hay fever, there wouldn't be any ragweed left in Iowa," DR. S. P. LEINBACH, of Belmond, declared during a panel discussion of agricultural health problems, at the Kirkwood Hotel, Des Moines, on August 10. His comment followed a report from DR. NORMAN B. NELSON, Dean of the SUI College of Medicine, that "allergies are one of the most common causes why farmers quit farming." DR. FRANKLIN H. TOP, Head of the new Agricultural Medicine Department at the University,

said that increased mechanization is responsible for many farm accidents. "Machines are made in terms of efficiency in getting the job done," he declared, "and not in terms of what the machine does to the operator. When horses were used years ago, the farmer had to stop to rest his horses. Today, machines can go 24 hours a day and farmers sometimes work seven days a week. So the farmer becomes tired and accident prone." AUBREY D. GATES, AMA Field Director for rural health, reported at the same meeting that, according to the USPHS, farming is the most hazardous occupation in the country today. DR. A. G. FELTER, of Van Meter, said that the underlying factors in cornpicker accidents are fatigue and hunger. "Farmers should go back to the days of the hearty breakfast and frequent lunches," he declared. DR. J. W. GAUGER, of Early, told about frequent backaches among farmers, and he attributed those difficulties to the fact that "in the spring they ride tractors 15 or 16 hours a day after a winter of much easier labor." And he pointed out that in many cases children eight, nine, and 10 years old, without the proper adult judgment and reflexes, are allowed to drive farm tractors. DEAN NELSON called attention to the fact that only one person in 10 is immunized against tetanus in Iowa. During the Second World War, he pointed out, every military man was so protected, with the result that there were no more than four cases of tetanus. "It is a terribly painful disease which farmers are very apt to get," he concluded.

—*J. Iowa State Med. Soc.*, September, 1955.

General Electric

ALL TOLD, the clinic regularly examines some 500 employees as part of its public health and accident-prevention program, and an additional 1,500 foundry, pottery, and chemical workers as a safeguard against occupational disease . . . . The voluminous nature of the unit's work calls for a fairly large staff. The doctor in charge of the clinic has six doctors, 20 nurses and technicians, three physiotherapists, and 12 clerical personnel under him. All told, the unit employs about 66 people . . . . Bearing in mind the original investment, to say nothing of current operating costs, how far can the clinic be said to "pay its way?" This is a difficult question to answer. On the tangible side, the annual cost per employee works out at about $18; the unit cost, about $2 a call. Though this amounts to a sizable sum, the company prefers to look upon it as an investment in the health of 35,000 people that is bound to pay dividends in the long run. The average GE employee is paid about $4,000 a year. Thus, a mere 1% improvement in morale, cooperation, and efficiency can be regarded as being worth $40 in extra production. It has been calculated that the clinic's good-vision program will increase some employee earnings by about $100 a year. Several millions can be saved, too, by the hearing-conservation program. Such factors as these can be looked upon as helping to reimburse the investment costs and perhaps ultimately showing a profit. Fundamentally, however, the clinic justifies itself as an instrument for maintaining health. Good health is its own reward. According to the Loss Prevention Department of the Liberty Mutual Insurance Company, a good in-plant medical service can reduce the cost of compensation and employee benefits by from 25 to 30%. Though it is too early for the GE clinic to confirm this prediction, there is every prospect of its being able

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1. Non-corrosive to metallic instruments and keen cutting edges.
2. Free from unpleasant or irritating odor.
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4. Non-toxic, non-staining, and stable.
5. Potently effective, even in the presence of soap.
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In choosing B-P CHLOROPHENYL, you avail yourself of a medium free from phenol (carbolic acid) or mercury compounds . . . one highly effective in its rapid destruction of commonly encountered vegetative bacteria (except tubercle bacilli). See chart.

Compare the killing time of this superior bactericidal agent

Vegetative Bacteria	50% Dried Blood	Without Blood
Staph. aureus	15 min.	2 min.
E. coli	15 min.	3 min.
Strept. hemolyticus	15 min.	15 sec.

No. 300 B-P INSTRUMENT CONTAINER is suggested for your convenient and efficient use of BARD-PARKER CHLOROPHENYL. Holds up to 8" instruments.

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to do so one day. In the meantime, the doctors, nurses, and other para-medical aids who make up the clinic's staff are dedicated to one of the most satisfying callings in life—rendering valiant service in a modern medical workshop.

—From "Blueprint for Health: GE's Program," by B. L. Vosburgh, M.D., in *The Management Review*, July, 1955.

Executive Frustration

For the last two years I have had an opportunity to study the tensions and frustrations of a group of executives. As a result of this study, I have come to see the problems of administration in a new light. I had always assumed, for example, that the anxieties which executives experience somehow grew out of the job itself. It came as a surprise to me, therefore, as it may to you, that after the study was made it was concluded that the tensions and frustrations of the executive lie, not in the job, but in the executive himself. Tensions in administration rarely ever exist with respect to things. Perhaps this may be because things are nice and comfortable. One can count on them. When you do something to them, their behavior is predictable. But these traits are not characteristic of people; and it is in the relationships with people that executives get into difficulty. A major source of many of the frustrations in administration seems to lie in the failure to develop a clearly understood system of values. All of us as human beings behave in terms of what we think is important. Whether we spend our money for a new car or for our children's teeth will depend upon what we value. The goals and values we hold have, in turn, an inevitable effect upon our behavior. By the same token, if we know what people value, it is not difficult to predict how they will behave in a given situation. Many of us claim one set of values while behaving as though we held another. There is a great deal of difference between knowing what we should value and truly holding these values. And when our own values are thus unclear, it is hard to decide what is important. One executive, who was starting on a new position, clarified his sense of values in this manner. He asked the company's Board of Directors to indicate what it felt was important for him to do on the job. In the course of his discussion of this problem with the Board, it was decided that coordination and programming should be his major responsibilities. As a result of this definition of values, the executive was given a business manager and three secretaries to handle most of the details of his job. Now he finds himself in the happy situation of being free three days out of every week to visit the various units in his company to accomplish the goals that have been established. When the executive lacks a clear value system, his behavior becomes puzzling to his subordinates. Even worse, this situation may result in a lack of confidence, fear and resentment toward the executive who, in turn, may experience further tension which may lead eventually to failure on the job. But

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it is not just the executive who loses when value systems are not clear. Everyone loses. The worship of objectivity also leads to frustration in administration. This trait is almost a disease of executives. Whenever it is necessary to deal with other people the cry goes up, "Get the facts!" This tendency has developed from the very erroneous assumption that people behave according to the facts. Here we have sold ourselves a bill of goods. Actually, people never behave according to the facts as *we* see them. If a worker thinks her foreman is unfair, for example, it does not matter very much, insofar as her behavior is concerned, whether the foreman is or is not fair. So far as the worker is concerned, what she thinks is so, is so. If we fail to understand this important factor we may fail entirely in dealing effectively with such a worker. Furthermore, the person who attempts to try to convince the worker just described that the foreman is not really unfair is likely to end up by demonstrating how little he understands, too! It is necessary to recognize that the executive and his subordinates live in different worlds. Consequently they do not see things alike. An executive, for example, sees the need for a new machine. He buys it and it is delivered. The employee, presented with a strange new object he does not see the need for, does not share the executive's enthusiasm for it. Consequently, he half-heartedly attempts to adjust to the new machine. This attitude angers the administrator who starts giving orders. Such order-giving is usually met with passive resistance. And who can say that passive resistance is not a most frustrating experience? The administrator who takes time to prepare his people for changes, takes time to tell them the why's and wherefore's, can eliminate such experiences. Placing great emphasis upon doing things overlooks the important fact that people do what seems to them should be done. In this respect, the people's opinion is dependent upon how they see the situation with which they are confronted, how they see themselves, and the importance of the object in view. When we attempt to get other people to do things without these factors being clear in their own perception, we give them a feeling of having been manipulated. This, in turn, produces a loss of confidence in the executive, a submission, distrust, fear, misunderstanding, hostility and veiled aggression, or an outright attempt to undermine the administrator's position. Emphasis upon doing things also has the effect of separating administrative activities from function or need. In his attempt to get action, the executive sets up rules so that things may get done smoothly and efficiently. Without a clear understanding of the function or need for such rules, however, it often happens that they become important only for their own sake.

—"Why Executives Become Frustrated," by Dr. Arthur W. Combs, digested from *Office Executive*, April, 1955, in *Management Guide*.

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1. Vainder, M.: Indus. Med. & Surg., 22:183, 1953

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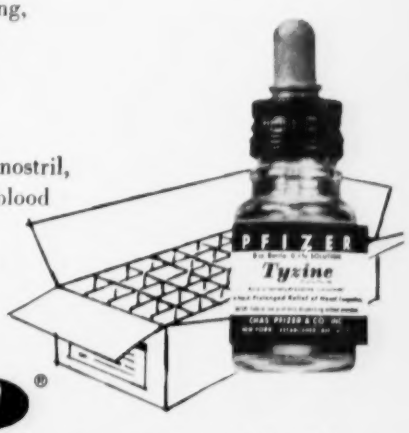

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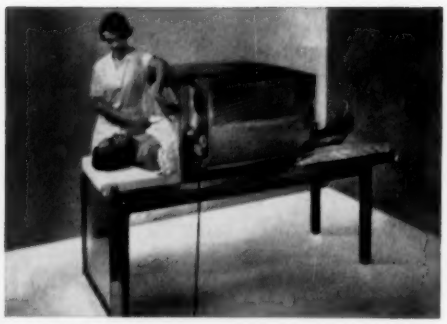

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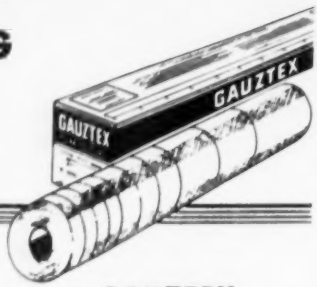

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1. Hellerman, L., *Physiol. Rev.* 17:454, 1937.
2. Barron, E.S.G. & Kalnitsky, G., *Biochem. J.* 41:346, 1947.
3. Goodman, L.S. & Gilman, A., *The Pharmacological Basis of Therapeutics*, 2nd ed., 1955, p. 970.

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